The Attention Selection Model

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THE ATTENTION SELECTION MODEL

THE EFFECTIVENESS OF CONSPICUOUS BRAND NAMES

Johan de Heer

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The effectiveness of conspicuous brand names

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Preface

This thesis is about the psychological concept of attention in association with advertising. It provides a rearrangement of past discoveries, in particular, from the areas of perception psychology and brain sciences. It is not my intention to claim any credit for the tremendous effort by researchers that have already elucidated the concept of attention, as we know it today. My contribution is to present some of these discoveries to the benefit of consumer researchers. For that, choices have been made to select the material that is relevant; knowing that other potentially relevant material is taken into account sometimes briefly, and sometimes not dealt with at all. Despite my search for comprehensibility, consumer researchers may feel that the way the topic of attention is approached is not really designed for them when they encounter the analogies between biological processes and the most important psychological theories of attention. Questions regarding "selective attention" may find their answers in psychology or biology; is selective attention psychological or (neuro)biological? The important difference between psychology and biology is that psychology reduces complex psychological processes to simple and understandable processes, which are still of a psychological nature, however. On the other hand, neuro-biologists explain these complex psychological processes by simple non-psychic processes (LeVay, 1993). It is believed that ultimately the Q and A with respect to selective attention are found in the structures, mechanisms, and processes in the human brain, which interact with the human, i.e. consumer environment. It is recognized that there is an enormous gap between the structure and strategies of the brain and the marketer who is confronted with the task of breaking his ad through the advertising clutter. To be sure, I have done my best to partly fill this gap and not to omit matters that the consumer researcher may consider important.

Chapter 1: General Introduction

On a daily basis, consumers are, as part of the total flow of information, exposed to a stream of information about products and brands from media advertising, packaging, point-of-purchase displays, etc. It is important to note that the information is often presented simultaneously, rather than only sequentially. In consumer research there is an increasing academic and practical importance of the questions how, when, and, why individual products or brands are selected or better, have a higher selection probability from the multitude of competing products or brands. The notion of information selection is inseparably linked with the concept of attention (Pashler, 1998). Attention serves as the important "tuning" mechanism in the selection of information. In academia, all consumer information processing models place attention in an early and important position (Olshavsky, 1994). It is widely accepted that attention is a necessary but not sufficient condition for information processing and the effectiveness of marketing communication.

> "Every conceptual model of advertising posits that consumers must attend to the ad as a necessary first step; that is, they must devote processing capacity to it (Greenwald and Leavitt, 1984; MacInnis and Jaworski, 1989). Thus, attention is perceived to be a critical mediating variable influencing the effectiveness of an ad" (Pechman and Stewart, 1990, p. 189)

For marketing practice, insight in selective attention is critically important for those who are confronted with the task of breaking through the advertising clutter (Ratneshwar, Warlop, Mick, and Seeger, 1997). So, what do we know about the nature, structure, and underlying processes and determinants of selective attention? Because of the sketched academic and practical importance one should expect to find a tremendous number of studies that examine attention systematically. Paradoxically, in consumer research, attention is being referred as an enigma (Janiszewski and Bickart, 1994) and has received very little research interest. Even so, as inspection of the literature shows, attention on attention is becoming of interest.

> "(...) Despite the tremendous amount of money spent on buying consumer attention, little to no research is done on consumer attention" (Janiszewski and Brickart, 1994, p. 329)

> "To date, little is known about the processes of attention, in particular of visual attention to advertising" (Pieters, Rosbergen and Hartog, 1996, p. 242)

> "(...) The role of attention in consumer choice has generated little research attention" (Pieters, Warlop and Hartog, 1997, p. 281)

> "(...) Despite its importance, visual attention has been disregarded in marketing research" (Pieters and Warlop, 1999, p. 1)

> "As competition for consumers' limited attention is even greater concern in today's crowded markets and media, it is important to understand how and when consumers devote attention to commercial stimuli and what determines their attentional strategies and patterns" (Rosbergen, Pieters and Wedel, 1998, p. 305)

> "Understanding the determinants of selective attention and elaboration in consumer information processing is important since the outcomes are crucial to product evaluation and memory for information which, in turn, impact brand preferences and choice behavior"

(Ratneshwar, Mick, and Reitinger, 1990, p. 547)

"Although attention is a key construct in models of marketing communication and consumer choice, its selective nature has rarely been examined in common time-pressured conditions" (Ratneshwar, Warlop, Mick, and Seeger, 1997, p. 245)

Lynch and Srull (1991, p. 104 from Lynch and Srull, 1982) with respect to memory and attentional factors in consumer choice: "(...) an explicit consideration of the underlying {cognitive} processes is imperative for any thorough theoretical analysis" (brackets added)

If we trace the consumer literature for knowledge about selective attention, it becomes clear that what is known is borrowed directly from other fields such as perception psychology. The conceptualization of attention that prevails in the area of consumer behavior research is based upon three theories of attention viz. Filter Theory, Capacity Theory and Resource Theory. These theories originate in the field of auditory and visual perception research during the 1950s and 1980s, where they primarily were applied to the *perceptual system*. These theoretical ideas were transferred to the area of consumer behavior. Note that in consumer research these three theories have not been criticized or questioned. Rather, they seem to have been adopted unconditionally and taken for granted.

Is there any reason to question these theoretical contributions? Or, in other words, have we been relying on the appropriate theoretical ideas and associated assumptions? To put it yet differently, are we still on the right path with our conceptualization(s) of attention or is it time to critically assess the direction in which the theoretical road is taking us?

The reason why we ask this is twofold. One is the observation that in visual perception research the three theories of attention have been subject of debate over the last 30 years; focusing on the questions why, how and when information is selected. Consumer research ignored or overlooked this debate. In any case, consumer research was not involved. Secondly, an interesting theoretical climate emerged in visual perception research some 15 years ago, which provides new, and potentially important insights that may impact theorizing on the concept of attention.

This new theoretical climate is characterized by the assumption of a functional relationship between perception and action. The relationship between perception and action has brought psychology closer to the biological sciences (see Prinz and Neumann, 1987 for an historical overview). "Psychologists have come to recognize that the behavior they study depends on biological processes (...) So the psychologist cannot feel that he has completed his work and explained a form of behavior until he has placed it in a biological perspective" (Berlyne, 1971, p. 8). "To me a psychologist is first a biologist" (Krugman, 1977, p. 7). It is believed that the action-related approach to attention is theoretically and empirically relevant to consumer research. The relationship between perception and action has been the object of a major and longstanding interest in consumer research. In this area, the question if the consumer can be given too much information remains important, however, unresolved (Bettman, Johnson and Payne, 1991). This question is still puzzling and Bettman et al. suggested almost a decade ago to examine "how consumers *select* their information" (1991, p. 67). This question and its research on information (over)load is driven by the possibility that consumers make less accurate choice decisions (that

is, action) with more information (that is, perception). Nevertheless, the relationship between perception and action has never been directly examined in consumer research (Pieters and Warlop, 1999).

In sum, despite its academic and practical importance, consumer researchers (1) have not examined systematically selective attention issues; (2) simply borrowed theories of attention from visual and auditory perception research; (3) have not discussed these theories of attention, which were developed outside of the field of consumer research; and, finally, (4) have not yet been persuaded into studying the functional relationship between perception and action.

Where do we take it from here? We start off by reviewing the classic visual perception literature up to the current paradigm of the action-related approach to attention [1]. Then, we will attempt to transfer these ideas to the consumer behavior research area.

Let us begin by describing the historical development of the three classic theories of attention viz. Filter Theory (Broadbent, 1958, 1971), Capacity Theory (Kahneman, 1973), and Resource Theory (e.g., Navon and Gopher, 1979; Norman and Bobrow, 1975; Wickens, 1980, 1984). Secondly, we will present the debates with respect to the why, how, and when of selective attention. These three questions are asked with the new theoretical climate in visual perception research in mind, i.e., with the assumed functional relationship between perception and action. Thirdly, we propose the attention-selection-model (ASM), which builds upon the theoretical analyses so far. Fourth, the attention-selection-model is empirically tested and the results are discussed. In particular, we explain why, how, and when conspicuous brand names vis-à-vis their contextual brands have different selection probabilities. For this, the effectiveness of briefly presented brand names was examined under different conditions of visual search and stimulus exposure durations. Recognition accuracy is chosen as the proxy for brand name effectiveness. Finally, the ASM is transferred to the area of consumer research, and its implications are brought in conjunction with some open questions in consumer research.

1 Note that a choice is made with respect to the enumerated citations. It is believed that theorizing on the concept of attention requires exactly what the respective authors in the field of visual perception and consumer research have communicated. The reason for the relatively large number of citations is to convey their ideas as precisely as possible.

CHAPTER 2: TOWARDS THE THEORIES OF ATTENTION

Chapter Introduction

Broadbent's Filter theory, as formulated in "Perception and Communication" (1958) and in "Decision and Stress" (1971), is the natural starting point for any discussion of *modern* theories of attention because it provides the first formal theoretical elaboration on this concept. The second formal theoretical elaboration in the style of Broadbent is Kahneman's Capacity theory and is found in Kahneman's monograph "Attention and Effort" (1973). Resource theory, the third theoretical elaboration, is formalized in diverse contributions by various authors (e.g., Navon and Gopher, 1979; Norman and Bobrow, 1975; Wickens, 1980, 1984). These three theories of attention are described because of the significant role they play in consumer research. In order to clarify the debates with respect to why, how, and when attention is selective, some other related theories are referred to as well.

Broadbent's Filter Theory (1958, 1971)

In Broadbent's original Filter theory (see Figure 1), concurrent information enters the processing system via our senses in parallel and is temporarily 'placed' in a short-term store (the so-called S-system). The theory assumes no limit on the structural capacity of the short-term store. Then, the information is relayed to the so-called P-system (P for perceptual) for further processing. At the *entrance* of the P-system, a 'selective filter' has to 'regulate' and 'protect' the arrived information in order to prevent its limited capacity channel from overload and confusion: thus, some stimuli (e.g., the relevant) will pass at the expense of others (e.g., the irrelevant). The P-system is responsible for further processing i.e., stimulus identification, recognition and / or categorization. Irrelevant information decays in the S-system without undergoing further processing. The rules according to which the filter operates (selection is not completely random) are specified by properties of the stimuli and by physical, mental, or emotional states of the recipients. It is assumed that the filter at the entrance of the system accounts for the 'selectivity' of attention.

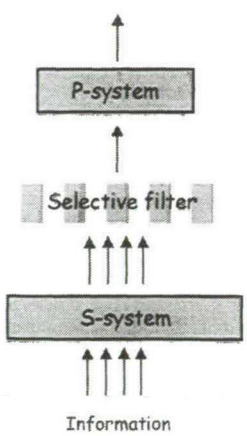

Figure 1: A diagram of the flow of information as conceived by Broadbent (1958, 1971)

Deutsch and Deutsch (1963) Response Selection Theory of Attention

Deutsch and Deutsch (1963) by their 'response selection theory of attention' (Figure 2) contrast Broadbent's entrance-by-filter-selection theory of attention. They rejected, on the basis of empirical evidence, both Broadbent's filter concept and the notion of limited capacity of the P-system. According to Deutsch and Deutsch all information that reaches our senses is perceptually analyzed at the highest possible level. In other words, all stimuli receive semantic processing (that is, the relevant and irrelevant stimuli). Unlike the P-system, they postulate a system containing a large number of 'central structures' which have a preset weighting of importance of information. This system determines what is selected for 'further processing', such as motor output and memory storage. The weights of importance, depending on the general arousal of the system, play a causal role in what is selected for subsequent processing. "Because, with adequate general arousal, it is the weights of importance that determine whether a message is selected or not, it is of fundamental importance to know what determines, in its turn, these weights of importance" (VanderHeijden, 1992, p.47). While the rules are not very clear, it is assumed that the central structures are linked together by connections that are established by experience (past learning). In turn, via these connections both the arousal of the system and its weighting of importance are determined (VanderHeijden, 1992). This is assumed to occur relatively late in the processing system and therefore the theory by Deutsch and Deutsch is characterized as a *late-selection* theory as contrasted by Broadbent's *early-selection* theory. Deutsch and Deutsch' (1963) 'response selection theory of attention' assumes capacity limitations not before but beyond stimulus identification.

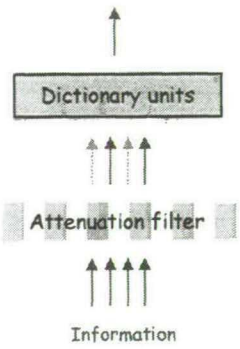

Figure 2: A diagram of the flow of information as conceived by Deutsch and Deutsch (1963)

Treisman's (1960, 1964) Theory of Attention

Treisman (1960, 1964) proposed a theory, in which she combined two simultaneously operating selection mechanisms (Figure 3). Treisman modified and replaced Broadbent's (1958) filter concept by an attenuation-filter. Broadbent's filter passes the relevant information and blocks the irrelevant information. Treisman's attenuation-filter weakens the irrelevant information (and passes the relevant information). Treisman's central structures denoted as 'dictionary units' are in close resemblance with Deutsch and Deutsch' central structures. The importance of the information sets the threshold level of the dictionary units (VanderHeijden, 1992). The

processing system is assumed to be limited in capacity. Note that the attenuation-filter makes selections on the basis on the physical characteristics of the stimuli, and the low threshold settings of the dictionary units induce that attenuated messages can still affect responding. In other words, Treisman's theory allows for two distinct loci of selection, that is at the input of the system (early selection) and at the output of the system (late or response selection). Interestingly, later on, Broadbent (1971) partly adopted Treisman's theory but termed some of parts of the processing system differently. Yet, Broadbent continued to use the term 'filtering' (Treisman's attenuation filter), and suggested the term 'pigeon-holing' or 'category-states' for Treisman's activation of dictionary units.

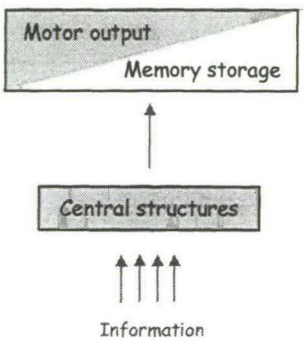

Figure 3: A diagram of the flow of information as conceived by Treisman (1960, 1964)

These three theories (Broadbent, 1958, 1971; Deutsch & Deutsch, 1963; Treisman, 1960, 1964) were mainly formulated in the auditory domain. Likewise, Sperling's (1960) theory of attention in the visual domain assumed early visual selection; only relevant visual stimuli receive semantic processing. In Coltheart's (1984) visual counterpart of the late selection view, all visual stimuli (the relevant and irrelevant) that enter our eyes receive full semantic processing.

Kahneman's Unspecific Capacity Theory (1973)

The Capacity theory of attention (Kahneman, 1973) builds upon the assumption that there is a general limit on human capacity to perform mental work. Another assumption is that this limited capacity can be allocated with considerable freedom among concurrent activities.

As Kahneman puts it:

> "Selective attention to inputs is the allocation of capacity to the processing of certain perceptual units in preference to others. The focussing of attention is very effective in preventing the irrelevant stimuli from interfering with the primary task, but there is evidence that irrelevant stimuli are sometimes processed at least up to the level of recognition units. In addition, one often perceives such stimuli, if they tend to be grouped with the message, if they represent obvious physical changes, or if they are both familiar and highly significant. These observations are consistent with the hypothesis that spare capacity is continuously allocated to the processing of perceptual units that are not emphasized. The present theory assumes a mechanism of unit information, which performs some functions that Neisser [1967] attributed to pre-attentive mechanisms. The stage of figural emphasis selects some of the units for especially detailed processing, much in the

> manner of Broadbent's filter. The emphasis on the selected messages is a matter of degree, as suggested by Treisman's [1960, 1964] concept of attenuation. The distinctive predictions of the present theory are that the effectiveness of selection depends on the ease with which relevant stimuli can be segregated at the stage of unit formation, and that the effectiveness of rejection of irrelevant stimuli depends on the amount of capacity demanded by the primary task" (Kahneman, 1973, p. 135).

On the one hand, Kahneman's Capacity model contrasts Broadbent's Filter Model by presenting a view that is different in two ways. First, Kahneman (1973) departed from the theoretical mainstream that sought the inspiration for theories of attention in communication sciences, i.e., Shannon and Weaver's (1949) 'Mathematical Theory of Communication', rather than in brain sciences (Neumann, 1996). Second, Kahneman did not adopt the filter notion. Kahneman's (1973, p. 12) criticism on Broadbent's Filter theory (1958) is presented here in the form of several quotes.

- "As initially stated (...) Filter theory is wrong"
- "(...) parallel processing of simultaneous stimuli does occur"
- "Furthermore (...) the content of an irrelevant message is identified, at least dimly and at least some of the times even when the subject attempts to ignore it"
- "Finally, the idea of a slow-moving filter that selects one stimulus at a time is not viable"
- "Thus, virtually all the predictions of Filter theory about what people *cannot* do have been disproved"
- "However, Filter theory provides a useful approximation to what people *usually* do"

On the other hand, Kahneman did not present his capacity model as a replacement for Broadbent's filter model. In fact, he argued that both models are needed to explain attentional phenomena.

> "A contrast was drawn between a structural model [Broadbents' Filter model, 1958], in which cognitive activity is limited by a bottleneck, or station at which parallel processing is impossible, and a Capacity model in which the limited capacity determines which activities can be carried out together. Neither model is adequate alone, but each captures some important aspects of cognitive activity" (Kahneman, 1973, p. 12)

> "The Capacity model (...) is intended to complement rather than supersede models of the structure of information-processing (...) [both models] (...) in fact, belong to different types: [structural models] (...) describe the sequence of operations that are applied to a set of simultaneously stimuli. In contrast, [the Capacity model] (...) describes the relations of influence and control between components of the system" (Kahneman, 1973, p. 11)

While Kahneman made the argument that both models complement one another, he also points to the opponent theoretical explanations with respect to interference. Interference refers to an incompatible task interaction.

> "Both types of theory predict that concurrent activities are likely to be mutually interfering, but they ascribe the interference to different causes. In a structural model, interference occurs when the same mechanism is required to carry out two incompatible operations at the same time. In a Capacity model, interference occurs when the demands of two activities exceed available capacity. Thus, a structural model implies that interference between tasks is *specific*, and depends on the degree to which tasks call for

> the same mechanism. In a Capacity model, interference is *nonspecific*, and it depends only on the demands of both tasks" (Kahneman, 1973, p. 11)

Neumann (1987, 1996) pointed out that Kahneman's *nonspecific interference*, as an empirical generalization, was not correct because of numerous demonstrations of specific interference. Note that the assumption that capacity is unspecific predicts that dual-task interference should depend on task difficulty, and be equal for all task combinations at a given level of difficulty (Neumann, 1987). Kahneman tried to account for these findings that violate his explanation by postulating structural interference as a type of interference that was not attentional. Kahneman suggested that, besides capacity interference, there is structural interference. This occurs because the activities occupy the same mechanisms of perception or response (Kahneman, 1973, p. 196). However, this solution lost plausibility as more examples of specific interference accumulated (Neumann, 1987, 1996). In particular, Wickens (1980, 1984) analyzed the dual-task literature on interference and argued that interference depends on the structure of the competing tasks, not simply on their difficulty. It "(...) saved the idea of unspecific capacity, but at the price of excluding conflicting results (namely, all cases of specific interference) from the range of explanation of the [capacity] theory" (Neumann, 1996, p. 405). For this reason it "has since led most students of attention to abandon the idea that capacity limits are due to a scarcity of general, unspecific capacity" (Neumann, 1987, p. 365).

Resource Theory

Resource theory tried to account for the empirical demonstrations against unspecific capacity. In contrast to capacity theory, resource theory postulates specific resources instead of a single, undifferentiated capacity (resource). "The concept of multiple processors or multiple resources imposed itself as the consequence of the failure of undifferentiated capacity" (Neumann, 1996, p. 405). Instead of a single type of central capacity, a set of different resource pools is postulated.

Resource theory is basically worked out in two ways. At first, Norman and Bobrow (1975; see also Navon and Gopher, 1979) introduced the distinction between resource-limited and data-limited processes, and came up with the performance-resource function and the performance-operating characteristic (POC). The distinction between resource-limited and data-limited processes refers to performances that can be less than perfect either because of the insufficient quality of the data, or because an insufficient amount of capacity allocation. Performance can only be improved in the latter case by allocating more amounts of capacity to the task. Note that the term 'resource' is largely synonymous with 'capacity' (Heuer, 1996). Capacity is a hypothetical variable with a certain relation to performance that is specified by the performance-resource function. The performance-resource function refers to the level of performance relative to the amount of invested resources. The performance-operating characteristic (POC) refers to a function in which the performance in task 1 is related to the performance in task 2; in other words, the POC describes how tasks affect each other in a dual-task situation.

The second way in which the resource theory is worked out is proposed by Wickens (1980, 1984), who proposed three main dimensions of resource pools: (1) processing stages, (2) modalities and

(3) brain hemispheres. The first dimension, stages of processing, refers to one resource pool reserved for central processing, and another resource pool for responding (Heuer, 1996). The modality dimension refers to the distinction between the visual domain and the auditory domain. The third dimension, brain hemispheres, includes verbal and spatial codes. The verbal code is associated with the left hemisphere, which plays an important role in the processing of verbal information, while the right hemisphere plays an important role in the processing of spatial information. Later on, Wickens (1984) organized these three dimensions into a scheme of resources in which each cell in the matrix referred to a conjunction of processing characteristics. "This revision had the advantage of providing a coherent, well-organized schema of resources. Its disadvantage was that it predicted no interference between tasks that belonged into different cells of the schema, which was empirically untenable. As Wickens pointed out, specific interference can be found between tasks that share only one of these processing characteristics, even if they differ on the other two dimensions. This cannot be explained by the dimensional model" (Neumann, 1996, p. 406/7). In addition, Wickens presented a second and alternative hierarchical model of resources, but like the dimensional model, did not come to grips with the empirical data either, and had to be abandoned as well. From the failure of the dimensional model and the hierarchical model Neumann (1996) concluded that the pattern of empirical results does not seem to lend itself to a simple schema of resources. Resource theory, in general, contributed to our understanding of attentional phenomena, but did not contribute that much to a theoretical understanding of limited capacity. Like Kahneman's capacity theory, it does not account for the empirical observations. Neumann describes this in detail.

> "(...) the description that subjects share their attention between the tasks remains correct as long as one considers only overall performance measures, such as mean tracking error or the average number of correct additions per time unit. The concern with overall performance rather than detailed mechanisms explains many of the strengths and weaknesses of capacity supply theories. Their main strength has been that they have, at the macroscopic level of analysis, contributed considerably to a refined empiric description of dual-task data" (Neumann, 1996, p. 402).

> "It is less certain that this approach [Resource theory] has added much to a theoretical understanding of limited capacity. In particular, the hope to discover quantitative relationships between invested capacity or resources and measured performance (performance-resource functions), and thus predict performance from resources, has proven futile (Navon, 1984). As has been pointed out by Neumann (1995), the fundamental problem is that, unlike economic resources in microeconomic theory, which are observables that can be directly measured, the hypothetical resources of capacity supply theories can be determined only indirectly via performance measures. This means that the intervening variable (resources) that is intended to predict a dependent variable (performance) is anchored only in this dependent variable, rendering their relationship circular. Performance-resource functions can therefore not be determined empirically; their shape is a matter of definition, not of discovery. In principle, this difficulty could be overcome by using converging operations, i.e. by anchoring capacity and resources in variables other than performance" (Neumann, 1996, p. 403).

> "It seems, then, that the belief in an undifferentiated capacity supply was motivated more by a theoretical conviction than by the empiric facts" (Neumann, 1996, p. 404).

"There is a risk that the empiric observations about he phenomena of attention (it is limited, can be shared between different tasks, can be allotted voluntary and involuntary, etc) are simply reworded as theoretical statements about the construct of capacity, suggesting an explanation where there is actually only a redescription" (Neumann, 1996, p. 404).

"Despite their insistence on multiplicity of resources, resource theories such as those of Navon and Gopher (1979) and Wickens (1980, 1984) were unitary theories in the sense that they postulated a single functional cause of all attentional phenomena, namely, an insufficient supply of something that is required for processing. In this respect, they did not differ from previous capacity theories. This common conviction of all dominant theories between the 1950s and 1980s had two implications, one for the theoretical view of interference, and one for the conceptualization of the relationship between interference and selection. As to interference, it was deemed to be a direct consequence of the limitation. If there is not enough capacity (transmission capacity, effort, computational power, etc.) for perfect performance, then the quality of the output will suffer, resulting in interference. This was such a simple and powerful idea that alternative causes of interference seem to have been substantially overlooked by most theorists" (Neumann, 1996, p. 409)

Let us look how Navon (1984) in hindsight looked at the testability of the Resource theory. The reason to cite Navon here is because he is one of the original proponents of Resource theory. As Navon notes in his article "Resources; A Theoretical Soup Stone?":

"It is fortunate (...) that an author can point to its limits of a methodology he or she advocated and do it before its use has proliferated (...). In this article I discuss the weakness of methods for diagnosing resource competition (...) on a rationale I found a little more attractive several years ago (see Navon and Gopher, 1979, 1980)" (p. 216).

"It is often taken for granted that processes demand processing resources that are available in limited amounts and that the task of the researcher is to *measure* that demand (...), the problem is usually regarded as a problem of measurement" (p.216)

"Why people accept this notion so readily is understandable. After all, in a very rough sense it is trivially true: The human processing system in toto is, by some loose definition, a resource, and because selection among stimuli of thoughts, or actions surely occurs, it may be viewed as the commitment of that resource to those objects of processing" (p. 217)

"Authors who did attack the notion (e.g., Allport, 1980; Neisser, 1976) simply refused to accept the existence of a reservoir of general purpose resources as a postulate because it was thought to have failed to function as a productive guide for research or because it was not compatible with their own views of the mind" (p. 217)

"(...) Like other proposed unifying principles, the notion of resources is valuable if it *generally* affords reasonably precise predictions, for example, about the amount of dual task decrement in the performance of any task, x, when conjoined with any other task, y (or at least within some well-defined and relatively large subsets of tasks). If it does not, we have yet to see good arguments about why it is more than a conventional way of speaking - a way of restating empirical observations in a language that goes beyond the observables. To be sure, conventions *are* typically convenient or else they would die out.

> However, from a scientific point of view they may constitute some risk. Apart from being excess that Occam's razor would bid us to dispense with, the speculative causal mechanism sometimes implicated by the usage of a conventional terminology, perhaps also acts as a red herring. It might be used as a ritual offering to appraise the gods of science and to divert their attention from the absence of substantive explanations for behavior" (p. 232)
>
> "If the concept was not sufficient to impose conceptual organization on phenomena in the field, then it might be suspected that that concept is actually a theoretical soup stone: Take the stone out, and the soup is still as good as it was. This article has demonstrated how gratuitous the stone may be" (p. 231)

In sum, Kahneman's capacity theory was not able to explain the empirical data (Neumann, 1996). This led to the current situation that researchers in attention have abandoned capacity theory almost completely. Resource theory (Navon and Gopher, 1979; Norman and Bobrow, 1975; Wickens, 1980, 1984) was also unable to explain the data, which as the cited references of Neumann show (1987, 1996; see also Heuer, 1987, 1996; and even (!) Navon, 1984, 1985) have caused some serious complexities with respect to the explanation of all kinds of attentional phenomena.

The concept of resources lacks explanatory value (Navon, 1984). Also, Neumann (1995) showed that both Wickens (1980, 1984) and Navon and Gopher's (1979) variants of the Resource theory amount to a redescription, rather than an explanation, of the observed data. "In view of these shortcomings, it seems fair to say that the resource concept has failed as an heir to Broadbent's channel capacity and Kahneman's unspecific capacity, i.e. as an explanatory concept for all kinds of attentional phenomena" (Neumann, 1996, p. 395; see also Neumann, 1987 and Heuer, 1985 for a full account).

TOWARDS THE ACTION APPROACH TO ATTENTION

So, where do we it take it from here? Are their other new developments regarding attention that are worthwhile to take as a point for further theorizing about attention? In fact, there is one important other theory of attention, i.e., Treisman's model for the perception of visual objects, which is known as the Feature Integration Theory (FIT) (Treisman, 1988).

> "A basic assumption of the model is that all features of objects – their colors, sizes, orientations, (direction) of movement, etc. – are coded automatically and spatially in parallel. They simply 'trigger activation' on the appropriate position in the appropriate maps (...) This automatic coding, however, is not regarded as sufficient for object perception and object recognition. Then combinations of features, called conjunctions, are required. And here, according to Treisman, visual spatial attention comes in. When features must be located and combined or conjoined to specify objects, attention is required. Attention provides the 'glue' (Treisman and Gelade, 1980, p. 98) which integrates the separated features *in a particular location* so that the conjunction, i.e., the object, is perceived as a unified whole (...) In Treisman's model 'Attention selects within a "master map of locations" that shows *where* all feature boundaries are located, but not *which* features are located *where*. Thus it distinguishes "filled" from "empty" locations, where "filled implies the presence of any discontinuity at the feature level' (Treisman, 1988, p. 203). In other words 'The medium in which attention operates, ..., is a master map of locations that specifies *where* in the display things are, but not *what* they are. It

indicates the number of elements, or filled locations, but not which features occupy which locations' (Treisman and Gormican, 1988, p.17)" (VanderHeijden, 1992, p. 248/9).

On the one hand, Treisman's FIT (Figure 4) is an important model because it accounts for a large set of experimental data that deals with the integration of visual information in unified wholes.

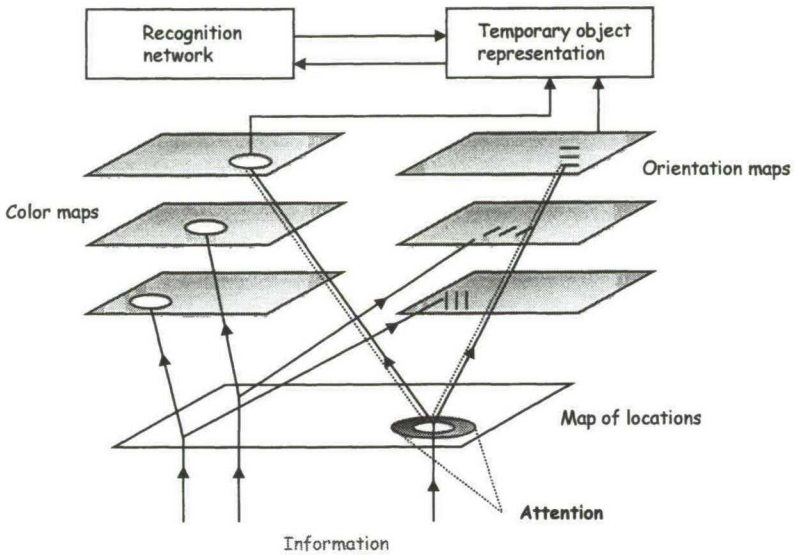

Figure 4: A diagram of the flow of information as conceived by Treisman (1988)

On the other hand, there is something else, which seems very trivial but is probably the most important point as it suggests a complete different theoretical approach. "[Treisman's] main ambition is in finding out what perceptual operations tax the system most and which appear to take place automatically (Treisman, 1988, p.201). It is, however, very easy to defend the general point of view that the perceptual systems are not just for 'perceiving' and the particular point of view that the visual system is not just for 'seeing'. The most important function of the visual system lies in the transformation of information in light into actions (reading, naming, walking, grasping, etc.). Vision, and all other 'perceptual systems have evolved in all species of animals as a means of guiding and controlling action...' (Allport, 1987, p. 395). Exactly this point of view brings theorists like Allport and Neumann to questions like 'what action?', 'how is the action directed?', etc. (...). This important 'action' aspect is, however, completely neglected in Treisman's model" (VanderHeijden, 1992, p. 250), just as it is neglected in all theories that we have discussed up to this point. So far only input and processing system reasons have been discussed with respect to selective attention. To put it differently, the models discussed so far are all interested in perception as such. We now turn to a different way of theorizing in which the relationship between perception and action plays a central role. We are strongly influenced by and borrow theoretical ideas from Allport (1987), Neumann (1987, 1996) and VanderHeijden (1992, 1996). Before we review a model of attention based upon the action-related approach we make a detour to and a lead start on the debates with respect to attention.

The view that processing capacity is limited is so widely accepted and taken as a given fact that one may forget it is the result of conviction (VanderHeijden, 1992). "The question *why* attention is limited has so far attracted comparatively little interest" (Neumann, 1987, p. 361). So, why are humans limited information processors? What is exactly induced by selections? These kinds of questions yield a 'new' development in visual perception research that "bears the hallmark of a paradigm shift in the sense put forward by Kuhn (1962), i.e., a scientific revolution in which the basic assumptions within a field are being reconsidered and redefined" (Prinz and Neumann, 1987, p. 2).

Allport (1987) gave the answer when he carefully entailed what was meant by the notion of 'selection'.

> "In (...) so-called 'early' or 'precategorial' selection (...) there is a strong implicit assumption that selection, defined as the *cuing* or *designating of task-relevant information*, must imply the rejection or exclusion of the noncued information from levels of analysis beyond that at which the selective cuing is held to occur. The conception that commonly underlies this assumption is that, beyond the level at which the 'selection' (that is selective *cuing*) occurs, all further processing is intrinsically serial; or, if not strictly serial, it is liable to 'overload' should the unwanted information not be successfully excluded (...) The assumption, that selective cuing of certain information necessarily entails rejection or *exclusion* of all other information beyond the level of processing *at which the selective cue itself is encoded*, is evidently unchanged when the assumption of strict seriality (...) is replaced by a unitary 'limited capacity' system. (...) The really important point to recognize, however, is that selection, in the sense of selective *cuing*, in no sense logically entails rejection or exclusion of the noncued information from further *processing*. (...) To put it in another way, the controversy regarding 'early' versus 'late' selection has systematically confused 'selection' as selective *cuing* and 'selection' as selective *processing*. Once the distinction is made clear, there may even be no controversy" (Allport, 1987, p. 408/9, underlined added)

Allport (1987) explained that the debate at what loci (early or late) in the processing system selections take place in principle deals with the question at what level information is cued - relatively early or late in the system, i.e., at a smaller or larger time distance from the senses, or at a lower or higher level of processing. Irrespective of the level at which the information is cued, the information is perceptually analyzed, i.e., processed at the highest level. In other words, if there is no capacity limit *to* process information, it seems that there is unlimited capacity *to* process. If this were the case indeed the implications would be quite dramatic: all information would be perceptually analyzed at the highest level, and there would not be a need for selection at all.

> "The selectivity of attention has traditionally been viewed as its second major attribute, besides limited capacity. Limited capacity theories did not ignore the selection aspect, but regarded it as a secondary consequence of limited capacity (...) as Broadbent (1971) put it: "The obvious utility of a selection system is to produce an economy in mechanisms. If a complete analysis were performed even of the neglected messages, there seems no reason for selection at all (p. 147)" (Neumann, 1987, p. 373/374)

> "there is no need for selection of processing (...) [there] is need for selection for other purposes than the processing of information" (VanderHeijden, 1992, p. 343)

Neumann (1996) notes that selection may have functions other than mere coping with limited capacity. VanderHeijden (1992; pp. 243-244) cites several authors who refer to these different functions: "One view emphasizes the richness and complexity of the information that is presented to the senses at any one time and the consequent risk of confusion and overload (Broadbent, 1958). The other view emphasizes the diverse and incompatible response tendencies that may be instigated at any one time and the consequent risks of paralysis and incoherence (Posner, 1978). (...) It is of course quite possible - indeed likely - that the organisms are threatened by perceptual overload and by response incoherence, and that different selective processes must be employed to control the two threats" (Kahneman and Treisman, 1984, p. 29). Thus, the view that the function of selection is to overcome the limited capacity may be supplemented by a second possible function of selection - the prevention of response incoherence. VanderHeijden (1992) even questions the first function of selection. He argues that the information processing system does not need to be more protected from information overload than it already is by natural, biological filters. His point is that if, in the human brain, the number of cells dealing with the processing of, for example, visual information is much larger (50 million) than the number of cells involved with visual information transmission (2 million ganglion retinal cells per eye), there is no need for an additional filter or selection device on top of the 'already built-in' capacity limitations of the eye and the optic nerve. VanderHeijden's (1992) reasoning (based upon empirical evidence) "does not recognize a central processing problem as a result of the richness and complexity of available information, or a threat introduced by perceptual overload. Rather, (...) "We have to find the diverse and incompatible response tendencies that may be instigated at any one time". And "We have to derive the need for all forms of selection from properties and requirements of actions" (VanderHeijden, 1992, p.244). Thus, the alternative view stresses that selection is rendered necessary not by the limited capacity to process but by the unlimited capacity to process.

> "Just as Kahneman and Treisman (1984), both Allport (1987) and Neumann (1987) recognize two essential forms of selection. The first from of selection is needed because there is one real 'capacity' limitation: human beings have only a limited number of effectors. So, there is a difference in capacity between the central information processing system (no capacity limitations) and the action system or effectors (a very limited capacity; generally only one action at a time can be performed). This form of selection has therefore to solve the problem, which action, or more precisely, which category or mode of action, from the total repertoire of possible actions, has to be given temporal priority (Allport, 1987, p. 395). It determines which skill is allowed to recruit what effectors at a certain moment in time (Neumann, 1987, p. 376). The second from of selection is needed because a selected action can generally be directed to only one among a number of simultaneously available objects at a time. In most natural situation, and also in most laboratory settings, there are, however, more potential targets to which a selected action can be directed. This form of selection has therefore to solve the problem of which object to act upon at a certain moment in time, i.e., the problem of where the action is now to be directed (Allport, 1987, p. 395). It determines from what region in space the set of parameters is taken that is allowed to specify the action in detail at a certain moment in time (Neumann, 1987, p. 376)" (VanderHeijden, 1992, p. 245, add underlining).

From VanderHeijden's (1992), Allport (1987) and Neumann (1987) it follows that it may not be 'limited capacity to process', but 'unlimited capacity to process' which makes selection necessary.

"Although the senses are capable of registrating many different objects together, effector systems are typically limited to carrying out just one action of a given kind of time. Hence the biological necessity and theoretical importance of selection-for-action." (Allport, 1987, p. 396-7). "The problem (...) is how to avoid the behavioral chaos that would result from an attempt to simultaneously perform all possible actions for which sufficient causes exist." (Neumann, 1987, p. 374). According to the latter approach, the limited number of effectors implies the function of selection for action. Therefore, the problem to solve is "which category or mode of action, from the total repertoire of possible actions, has to be given temporal priority." (VanderHeijden, 1992, p.245). This selection mechanism is not needed to prevent information overload, but finds its reason in the simple observation that "a selected action can generally be directed to only one among a number of simultaneously available objects at a time" (VanderHeijden, 1992, p. 245; underlining added). The problem to solve is "which object to act upon at a certain moment in time" (VanderHeijden, 1992, p. 245), which is, according to VanderHeijden, exactly the function of selection provided by (visual) attention.

In addition to the selection-for-action view Neumann (1996) also suggested another reason for selection, i.e., the selection-for-memory view. The selection-for-memory view refers to another function of selection that serves the selective storage of experiences, "we need not store everything, but we should store what is important for the future" (Neumann, 1996, p. 438). Neumann refers to the two different functions of selections as follows.

> "(...) One [function] is that attention serves as the selective storage of experiences; the other is that selection is needed for the control of action. (...) The notion that attention may be related to memory has played a certain role in modern theorizing, although it has rarely been proposed that controlling access to memory is a function of attention. Deutsch and Deutsch (1963) proposed that the consequence of attentional selection is to "switch in further processes, such as motor output, memory storage, and whatever else it may be that leads to conscious awareness" (p.84). Both filter theory and corresponding models of visual information processing such as that of Sperling (1960) assumed that nonselected stimuli do not contact short-term or long-term memory. VanderHeijden (1981) proposed explicitly that attention has the effect of preventing 'short term visual information forgetting'" (Neumann, 1996, p. 438/9).

The following quote by Berlyne (1971) demonstrates implicitly the selection-for-action view.

> "We can at any one time respond to only a small number of stimuli. Stimuli will thus be competing for control over our behavior, and there must be ways of determining which stimuli will win the contest". (Berlyne, 1971, p. 100)

Zeki (1999), a foremost researcher on the brain, points to the functionality of selection in relation with the memory storage of information.

> "Vision, in brief, is an active process that depends as much upon the operations of the brain as upon the external, physical environment; the brain must discount much of the information reaching it, select only what is necessary in order to obtain knowledge about the visual world, and compare the selected information with its stored record of all that it has seen" (Zeki, 1999a, p. 78).
>
> "(...) We see in order to be able to acquire knowledge about this world" (Zeki, 1999b, p. 4)

Ergo, there are two views, i.e., the limited capacity view and the unlimited capacity view. Both views agree about the necessity of selection. They differ, however, with regard to the presumed reason why selection takes place. The view assuming selection for reasons of processing limitations (selection-for-processing) may need to be supplemented with the view assuming selection for reasons relating to action possibilities (selection-for-action) and memory storage (selection-for-memory). The critical point to note here is that the assumption of limited capacity has put forward a way of theorizing which seems to lead to a dead end. It is important to recognize that also the unlimited capacity view is based on convictions. However, the unlimited capacity conviction builds on relevant anatomical and physiological evidence, as we will see later on [2].

The action approach to attention is rather positively formulated as compared to the traditional views of attention. The selective aspect of attention as a consequence of the limited capacity view has a protective nature and function. The task that is provided by visual selective attention is to act in a goal-directed manner.

> "Regarding the relationship between selection and interference, there was likewise a broad consensus from the 1950s to the 1980s. Since Broadbent's (1958) filter theory, attentional selectivity was viewed as a secondary consequence of limited capacity: selection is required to come to grips with capacity limitations. It was largely overlooked that even an organism whose brain enjoys an (for all practical purposes) unlimited capacity would have to select between alternative actions, and between alternative stimuli that control these actions. According of the view of capacity that will be discussed (...), this means that unwanted actions have to be suppressed, and unwanted stimuli have to be prevented from gaining access to the control of behavior, causing a type of interference that is an achievement rather than a shortcoming". (Neumann, 1996, p. 409).

Researchers in visual perception, in particular Allport (1987), Neumann (1987, 1996), and VanderHeijden (1992) focused on some of the complexities regarding the classic psychological theories of attention. These scientists provided the basis of one important development that emerged in visual perception research in the last 15 years. This theoretical development concerns the proposed *functional relationship between perception and action*. The relationship between perception and action has brought psychology closer to the biological sciences (see Prinz and Neumann, 1987 for an historical overview). Note that Filter Theory, Capacity Theory and Resource Theory are based on information technology (cf. Shannon and Weaver, 1949), which linked psychology to communication technology. However, "the relationship between perception and action is a question, at least, a log unit more complex than questions concerning their separate functions (...) [because] (...) the variety of variables influencing the observed relationship between perception and action precludes any hope for a simple solution (...) [which] (...) illuminates (...) how much of the problem is empirical and not simply theoretical" (Massaro, 1991, p. 134/5).

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2 Also Treisman's FIT is consistent with anatomical and physiological evidence, and also compatible with the notions of unlimited capacity. The FIT can be characterized as unlimited capacity to process and selective enhancement by selective attention (VanderHeijden, 1992, p. 250). We abandon the FIT, because the action part, which seems so relevant for consumer research, is missing.

SELECTIONS AND TYPE OF RESPONSE

To pick up Massaro's point, how can we artificially induce selection-for-action and selection-for-memory in an experimental set-up? In other words, what is the researchers' task given that the reasons of selective attention are found in the control of action and in the storage of experiences?

> "(...) the selection of the action - is artificially induced in (...) simple information processing experiments (...) The experimenter 'simply' instructs the subject which category or mode of action has to be given temporal priority. In one or another this instruction (...) not only prevents "the behavioral chaos that would result from an attempt to simultaneously perform all possible actions for which sufficient causes exist" (Neumann, 1987, p. 374); the instruction also has the quite remarkable result that subjects generally start to produce the unique, and the only unique, behavior requested". (VanderHeijden, 1992, p. 246)

In other words, if the researcher instructs subjects how to act and where to act upon, then the researcher prevents behavioral chaos, i.e. action interference and response inconsistencies. The required response may be associated with the selection-for-action view. On the other hand, if no specific instruction is given to the subjects to memorize the presented information, then what is memorized is likely to be the result of the second function of selection, i.e., selection-for-memory. Here, we denote this second type of response as an effectiveness response. An effectiveness response is induced without any specific instruction to memorize items in the stimulus environment. Both functions of selection are brought about by selective attention (Table 1 summarizes).

TABLE 1: Different functions of selection

Functions of Selection	Type of Response
Selection-for-processing	Required
Selection-for-action	Required
Selection-for-memory	Effectiveness

The question is if both these functions of selective attention can occur simultaneously. In other words, are selection-for-action and selection-for-memory mutually exclusive?

> (...) The ideas that selection is in the service of action control and that it serves memory storage are not mutually incompatible. Neumann (1990) has suggested that there are phylogenetically old selection mechanisms that subserve the immediate control of action (selection-for-action in Allport's, 1987, terms), and that the evolution of mammals has produced a second function of attentional mechanisms, the updating of an internal representation of the world" (Neumann, 1996, p. 438/9).

VanderHeijden's Post-categorical Filter Model (1992)

VanderHeijden's Post-categorical Filter Model (1992) is discussed next. The first reason is that it builds upon the theoretical ideas of the action-related approach to attention. Second, the report task methodology is associated with his model (discussed in Chapter 3), that is conducted in consumer research experiments as well. Finally, yet a third reason is that the model is also appropriate to visual search (Theeuwes, 1992). A little later on we deal with visual search. VanderHeijden's (1992) model is fundamentally at variance with all views that postulate that there is limited processing capacity, and that *for this reason only* selections are necessary to protect this limited capacity central system against overload. In his view, the central system is characterized by unlimited processing capacity. As noted earlier, he argues that the information processing system does not need to be more protected from information overload than it already is by natural, biological filters. The basic structure of his model consists of an 'input map', an 'identity domain' and a 'location map'. Information enters the input map (IN) and is sent in parallel by two independently visual pathways to an identity domain (ID) and a location map (LO) (see figure 5).

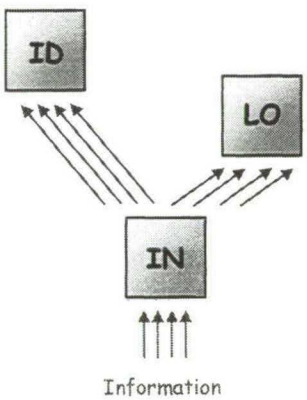


Figure 5: A diagram of the flow of information as conceived by VanderHeijden (1992)

Information of stimuli is represented in the input map (IN), albeit not yet explicitly. Identity information of stimuli is transferred to the identity domain and positional information of a stimulus is transferred to the location map. Identities are triggered (VanderHeijden, 1992) or calculated (VanderHeijden, 1996) in the identity domain and positions are coded (VanderHeijden, 1992) or calculated (VanderHeijden, 1996) in the location map. To put it differently, all processing that can be done is in fact done (VanderHeijden, 1987). Thus, explicit representations of stimuli are found in the identification domain (ID) and the location map (LO). The model so far assumes that identity and position processing are independent. Although his data showed (see VanderHeijden, 1992, p. 252, Table 8.3.1) that "the probability that there is identity information given that there is no location information is very low as compared with the probability that there is identity information given that there is location information" (VanderHeijden, 1992, p. 252/3). Meaning and suggesting that, the processing of position and identity is not independent but dependent. The simple and elegant solution to solve this empirical

finding was provided by adding a "feedback" loop from the location map (LO) to the input map (IN) (see Figure 6)

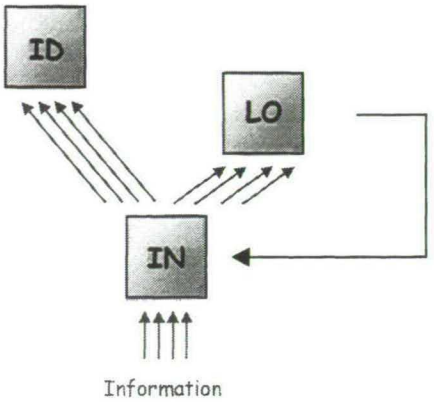


Figure 6: A diagram of the flow of information as conceived by VanderHeijden (1992)

> "The operation of the feedback loop can be regarded as a visual-perception internal kind of selective attention triggered by position information or the onset of position information. So, in this view, it is not attention, coming from nowhere, that is directed at a position in a map of locations. The map of locations is the *source* of the attention. Location information - if fed back to the input module - *is* the attention. Not attention directed at position, but position directed as attention (...). The assumption, however, is that this loop is triggered by position information and contains no identity information (...). We therefore propose that the operation of the feedback loop has no function in the identification of the information but only in the selection of identified information (...) Taken all together, the scheme depicted (...) can be regarded as a kind of basic circuitry combining identity processing, location processing and a built-in or hard-wired form of 'selective attention'. It implements something like 'postcategorical filtering' and 'selection'; the addressing sequence is: position - features on position (all features; not only relevant features) - identity (...) it can be regarded as the kernel of the 'difference generator' which attention research in visual information psychology seeks" (VanderHeijden, 1992, p. 254/5).

Position processing and identity processing occurs in parallel. However, the identity information cannot become available without the position information from the position channel. "The location channel feeds back in parallel the location information of <u>all</u> stimuli represented in the input module; yet, the position that receives additional activation is thought to be <u>selected</u>" (Theeuwes, 1992, p. 44).

Allport (1987) made some important notes with respect to the confusion of 'selection' as selective cuing and 'selection' as selective processing. "*Selective cuing* operates predominantly in terms of physical, or 'precategorial', sensory attributes, whereas *processing* of both cued and noncued information proceeds at least to categorical levels of analysis. VanderHeijden has called this 'postcategorical filtering'. In this case we would have 'early selection', in the sense of selective *cuing* or specifying of task-relevant information, *and* 'late selection' as regards the further *processing* of both relevant and irrelevant information" (Allport, 1987, p. 409).

So far we have described the historical development of the three theories of attention that were transferred to the consumer research area (Filter theory, Capacity theory, and Resource theory). In addition, we have referred to some other related theories (Deutsch and Deutsch's theory, Treisman's early accounts (1960, 1964) and late account (1988)). Further, we introduced the action-related approach to attention by the assumption of a functional relationship between perception and action. And finally, we presented VanderHeijden's model, which builds on this approach. We now turn to the debates, which are generally ignored and overlooked in consumer research.

THE WHY, HOW AND WHEN OF SELECTIVE ATTENTION

WHY IS ATTENTION SELECTIVE?

Why is attention selective? To answer this question, one has to focus on two central aspects, (1) capacity and (2) selection. These aspects are basic and inescapable if one deals with the concept of attention (Pashler, 1998). Capacity and selection are two sides of the same attention coin.

In Broadbent's (1958, 1971) Filter theory the *capacity* of the information processing system (P-system) is metaphorically conceptualized as the transmission capacity of a channel, and *a filter performs selection*. This filter either blocks (Broadbent, 1958) or attenuates (Broadbent, 1971, adopted from Treisman, 1960, 1964) the flow of information. In Kahneman's (1973) capacity theory the metaphor for *capacity* became that of a 'supply', and *selection* was its allocation. Finally, in Resource theory (Navon and Gopher, 1979; Norman and Bobrow, 1975; Wickens, 1980, 1984) *capacity* was metaphorically conceptualized as (pools of) resources (each) with limited capacity. The *selection* problem receded into the background relative to the *capacity* problem. The topics were the nature and measurement of resources (in dual-tasks), while the mechanisms that supposedly allocated these resources remained largely unspecified (see Neumann, 1996).

All three approaches have shared the conviction that the basic characteristic of attention is *limited capacity*. In particular, *selection* was conceptualized as a functional consequence of *limited capacity*. For example, because Broadbent's (1958) central channel had a limited transmission capacity there was a filter that protected it from overload and confusion. Similarly, because there existed only a limited supply of Kahneman's (1973) unspecific capacity, it had to be strategically allocated. *Selection* was viewed as the way in which the system copes with its *limited capacity* (Neumann, 1987, 1996; VanderHeijden, 1992). Allport (1987), therefore, denoted this form of selection as *selection-for-processing*. In sum, one of the fundamental ideas about the processing system is that it is limited in capacity and that selection is selective processing. In contrast, Allport (1987), Neumann (1987, 1996), and, VanderHeijden (1992, 1996) all share the view that the processing mechanism is characterized by its unlimited capacity to process information. Selection is a functional consequence of the limited number of effectors that do not allow that simultaneous actions can be performed at one time. Selection is selection-for-action and selection-for-memory. Note that the unlimited capacity view as proposed by Deutsch and Deutsch (1963) "assumes that there are processes, occurring subsequent to stimulus identification, that demand capacity (...) [However,] it is not easy to see how it can interpret capacity limitations as simply due to the brain's functional capabilities. If the brain is capable of processing all stimuli completely, why should it not also have the capability to perform

all further processing operations without capacity limitations? Thus, it is within the logic of the 'late-selection' approach to look for functional reasons of limited capacity" (Neumann, 1987, p. 367/8).

Ergo, as noted earlier, there are two views, i.e., the limited capacity view and the unlimited capacity view. Both views agree about the necessity of selection. They differ, however, with regard to the presumed reason why selection takes place. The view assuming selection for reasons of processing limitations (selection-for-processing) may need to be supplemented with the view assuming selection for reasons relating to action possibilities (selection-for-action) and memory storage (selection-for-memory).

HOW or WHERE IS ATTENTION SELECTIVE?

The traditional approaches discussed so far have either shared the conviction that the basic characteristic of attention is *limited capacity* (e.g., Broadbent, 1958, 1971; Sperling, 1960, Treisman, 1960, 1964) or that the basic characteristic of attention is *unlimited capacity* (e.g., Deutsch and Deutsch, 1963; Coltheart, 1984). In the limited capacity view, selection occurs relatively early and precedes stimulus identification (e.g., semantic processing). In the unlimited capacity view (Deutsch and Deutsch, 1963), selection occurs relatively late at a stage containing information that is identified. VanderHeijden (1996, p. 18) characterized these views as the 'early-selection limited-capacity' view and the 'late-selection unlimited-capacity' view, respectively. In similar vein, Treisman's (1960, 1964) marriage of these two views can be characterized as 'early selection allowing for late selection limited-capacity' view. Remember that Treisman's model has two selecting mechanisms: an early and a late one, but considers the central processing system as limited in capacity. In essence, given that the capacity and selection issue are in principle independent (VanderHeijden, 1987), we have two plausible options left: the 'early-selection unlimited-capacity' view and the 'early selection allowing for late selection unlimited capacity' view (see Table 2). Note that a 'late selection limited capacity' view is unlikely on logically grounds.

TABLE 2: *Capacity and Selection*

Selection	Limited Capacity	Unlimited Capacity
Early	Broadbent, 1958 (Filter theory)	VanderHeijden, 1992 (post-categorical filter model) Treisman, 1988 (Feature Integration Model)
Late		Deutsch & Deutsch, 1963 (Response selection model)

Early/ Late	Treisman, 1960, 1964 (Attenuation model) Broadbent, 1971 (revised Filter model)	DeHeer, (this thesis) (Attention-selection-model; to be described later on)

As Keele remarks (cited in VanderHeijden, 1987, p. 422): "if selectivity occurs at the level of physical characteristics of the message, why does the meaning of the ignored message affect response to the selected message? If, on the other hand, selectivity occurs at the level of activated memory, why do physical characteristics of the sound, namely direction and frequency, affect selection?"

VanderHeijden (1992, see also VanderHeijden, 1987) explained these two completely different models (early versus late) by looking very carefully at the factors that were experimentally varied and at the factors that were experimentally fixed. He pointed at the crucial experiments in which subjects were given auditory tasks that looked rather similar (at first sight!). These experiments were close to orthogonal in what was varied and what was fixed. Broadbent varied 'channels' (e.g., left versus right ear, ear versus eye, et cetera) while keeping the contents of the stimuli fixed (e.g., digits). Thus, Broadbent experimentally fixed 'expectation' (digits and digits again were presented to the subjects) and varied channels. Deutsch and Deutsch experiments varied the contents of the stimuli as well: something like 'meaning' varied, i.e., expectation varied. "experiments led to the conviction that what is varied, just because it is varied and shows differential effect, exists and is important, while what is fixed and therefore shows no differential effects, does not really exists or is of no importance" (VanderHeijden, 1992, p. 48).

In sum, there are two selection factors which may reveal themselves simultaneously: "in nearly all attentive acts at least two factors can be recognized: attention and expectation" (VanderHeijden, 1992, p. 49). Yet, a third attentional factor, which can not be omitted, is denoted as 'intention' (VanderHeijden, 1992 which he adopted from Gibson, 1941). This third factor 'intention' is associated with 'action set' and is concerned with 'what to do' consisting of 'an intention to act' and 'to act in a specific way'. "This analysis of selection (...) suggests the conclusion that (...) more attentional factors or selective processes have to be distinguished: one process concerned with the 'where' (i.e., controlling the source of stimuli to be responded to), a second concerned with the 'what' (i.e., controlling what aspect of the stimulus is importance) and a third concerned with 'what to do' (i.e., controlling whether, and if so, how, to react)" (VanderHeijden, 1992, p. 55). Table 3 summarizes some related terms to early and late selection.

TABLE 3: Terminology early / late selection

Early Selection	Late Selection
Where	What
Location	Identity
Channel variations	Meaning variations
Stimulus set	Response set
Input selection	Output selection

The Winner Takes All - a computational solution

In addition to the early-late selection debate, various computational hypotheses for modeling visual attention have been proposed that solve the problem how selective attention operates (e.g., Bundesen, 1990; Olshausen & Koch, 1995; Tsotsos, 1998). Note that the present discussion on where and how items in a visual scene are selected slowly changes over to the next debate concerning when attention is selective. Computational solutions are all based on similar principles: "selection of items to process is implemented by a winner-take-all mechanism using a representation of saliency based on the early representations" (Tsotsos, 1998, p. 216). Like the traditional models of attention, computational modeling assumes that there is insufficient brain capacity to process all visual stimuli to the same degree of detail. On the other hand, the model proposed by Koch and Ullman (1985), which is at the basis of several other computational models (Itti, Koch and Niebur, 1998) is related to Treisman's Feature Integration Theory. Computational approaches to attention have not yet looked at the action-related approach to attention. Remember, however, that Treisman's FIT is not incompatible with the unlimited capacity notion (VanderHeijden, 1992). Another reason why we discuss Koch and Ullman's (1985) model (see Figure 7) is that it builds on a plausible biologically architecture (Itti and Koch, 1999a, b; Itti, Koch and Niebur, 1998). In other words, the model is biologically convincing and, therefore, fits nicely with the action-oriented approach to attention. Both the computational approach to attention and the action-related approach to attention bring biology closer to psychology and psychology closer to biology.

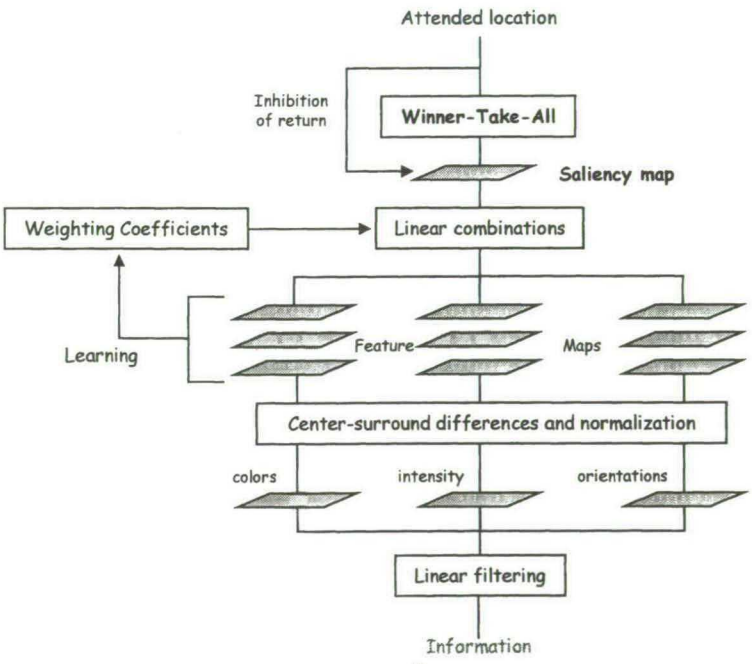


Figure 7: A diagram of the flow of information as conceived by Koch and Ullman (1985)

> "Visual input is first decomposed into a set of topographic feature maps. Different spatial locations then compete for saliency within each map, such that only locations, which locally stand out from their surround, can persist. All feature maps feed, in a purely bottom-up manner, into a master "saliency map", which topographically codes for local conspicuity over the entire visual scene. In primates, such a map is believed to be located in the posterior parietal cortex as well as in the various visual maps in the pulvinar nuclei of the thalamus. The model's saliency map is endowed with internal dynamics, which generate attentional shifts. This model consequently represents a complete account for bottom-up saliency, and does not require any top-down guidance to shift attention" (Itti, Koch and Niebur, 1999, p. 1).

VanderHeijden (1992, p. 264) also points to the structural solution of the visual system how to deal with multiple stimulus onsets in order to overcome behavioral chaos.

> "With multiple simultaneous onsets the input-module-location-module-input-module feedback loop is activated for several positions at the same time (...) this stimulus situation results in an ambiguous system situation: or hypothetical attentional circuit gets jammed or confused. But 'something' has to be done, and it is not surprising that the system has its own solutions for handling such a situation and that as a result unique phenomena are observed" (VanderHeijden, 1992, p. 264). "The system itself gives temporal priority to one abrupt onset from among a number of simultaneously occurring abrupt onsets" (VanderHeijden, 1992, p. 266).

The solution provided by the computational approach is that the most conspicuous item in the visual scene is selected on the basis of a WTA procedure. Note that this solution concerns unintentional acts, i.e., it is a bottom up, stimulus driven solution. The computational solution to intentional acts is found "in the 'guided search' feedback from higher cortical areas (e.g., knowledge about targets to be found) (...) to weight the importance of different features" (Itti, Koch and Niebur, 1999, p.1). Itti et al. (1999) here point to the 'knowledge about targets to be found' in intentional visual search tasks. At the present time, however, computational solutions to intentional acts have not come further than computer simulations. These simulations are based theoretical ideas on human visual search and psychophysical studies. Here also the computational approach relies on the classic ideas on visual search guiding principles, and does not yet take the action-related approach into account. We borrow from Prinz (1986) who illustrates some difficulties with the traditional approach to visual search. The traditional idea is that the target of interest (the item to be found) is represented internally and is searched for until a stimulus object in the environment is identified as the object that matches it. This view assumes that "target detection is brought about by target identification. (...) At lower levels, (...) where feature recognition occurs, these mechanisms are entirely stimulus-driven, and no selective preparation is possible. However, at the cognitive level where [stimulus, i.e., letter] recognition occurs, top-down directed processes do provide task-specific preparation. (...) As a consequence, nontargets are never identified, and targets are detected by virtue of the fact that they are identified" (Prinz, 1986, p. 231). According to Prinz "target detection sometimes occurs without (before) identification (...) [which] seems to indicate that detection and identification can become dissociated under certain conditions" (Prinz, 1986, p. 231). Therefore, Prinz (1986) suggested a different guiding principle for visual search that looks quite similar but in fact is not. He assumes that search is not guided by target control, i.e., relevant target information given by instruction, but rather "to assume that targets are detected by *default*. With this

explanation, a target is detected because it is a nontarget" (Prinz, 1986, p. 232). Prinz (1986) argued that experimental studies are biased to examine intentional tasks (controlled by instruction) as compared to unintentional tasks. He associates an unintentional task with unspecific selection, that is selection by default with respect to some internal model of the environment. Therefore, "the traditional theories of attention that cover mainly intentional, relevance-based 'specific' selection must be complemented by theories of unintentional, pertinence-based, 'unspecific' selection" (Prinz, 1986, p. 237/8).

> "The issue of whether the detection of targets presupposes the identification of the items in the list, or whether it can also be based on a analysis of their physical (visual) features, is clearly a task-specific version of the early-versus-late selection debate in the literature on attention. Students of search paradigms have tended to claim that, in principle, selection does and can occur at both levels and that the actual task demands determine which level is used (...) I (...) adopt a stronger version of this claim, namely, that selection can occur at both (or perhaps more) levels simultaneously (...). [This] makes sense in the framework of models, which maintain that processing is independent from selection, i.e. that the locus of selection has nothing to do with the depth of processing (VanderHeijden, 1987; Allport, 1987). With this view, selection is no longer selection in the sense of rejecting or attenuating irrelevant information, but rather in the sense of creating some functional difference between relevant and irrelevant information. When this framework is adopted, the assumption of simultaneous selection at different levels of processing poses no problem at all" (Prinz, 1986, p. 232/3)

The implications of the view Prinz (1986) proposed are not incompatible with the computational solution if we assume that the winner-takes-all procedure operates as follows. The solution that is proposed here is that the most salient or conspicuous item vis-à-vis its contextual items is cued (for memory storage, action). A second implication of Prinz's contextual approach is that selections at different processing levels (early or where level and late or what level) are possible and can occur simultaneously.

WHEN IS ATTENTION SELECTIVE?

Vision has evolved so that we continuously select useful information that enters the visual processing mechanism (Prinz, 1986), but we also search for useful information in our environment. Eye movements play an important role in making parts of the visual environment accessible for inspection. During visual orientation our eyes move four or five times per second, and each time a saccadic eye movement is made, the eyes briefly fixate at one particular region in the visual environment. Two research approaches to visual search are associated with eye fixations and saccadic jumps (Sanders and Donk, 1996). The structural constraint research tradition is concerned with the question 'What kind of information is extracted at each fixation time?' (Sanders and Donk, 1996). The concern of researchers that follow this tradition is, where in the processing mechanism selections are made. In other words, is the locus of selection early or late? The other tradition, known as the functional strategic research tradition, is concerned with the question 'What determines the position of the next fixation; is the locus of control in visual search externally or internally guided?' (Sanders and Donk, 1996). Note here that the aforementioned computational solution to guiding principles regarding visual search is closely related to the functional strategic research tradition. The structural constraint research tradition is related to the early / late selection debate. Both research traditions find their

connection in visual search. Other terms that relate to internal and external control, which are treated as synonyms and are used higgledy-piggledy in visual perception literature are denoted in Table 4.

TABLE 4: Terminology External / Internal control

External	Internal
Exploratory	Goal-directed
Involuntary	Voluntary
Exogenous	Endogenous
Unintentional	Intentional
Environmental / world	Person
Bottom-up	Top-down

In general, all researchers do consider that both external and internal control should be viewed as endpoints on a continuum, but in normal circumstances it is most likely that an interaction between them guide the search process (Folk and Remington, 1996). Thus, researchers that follow the functional strategic tradition are concerned with when selections are made. Sanders and Donk (1996) argue that the subdivision between the two traditions is not absolute: a combination of structural constraints and functional strategies is thought to determine the final search pattern to extract the information that may be useful in a natural environment. In fact, also Broadbent (1987) argued for a hybrid between a structural and strategic approach.

> "The search for structure is a very rational hope that we can find variables whose relationships stays constant. If we would find such variables, then we would not need to hedge every psychological finding by confining it to particular circumstances (...) Certainly strategic factors penetrate very far into the most apparently simple tasks. If, therefore, we search for structure (...), we shall keep getting defeated, because there are in fact hardly any mechanisms that operate the same way regardless of circumstances. One person is quite different from another, and the same person changes, depending on past experiences and on the momentary situation" (Broadbent, 1987, p. 78)

Therefore, "We need a kind of structure that allows for strategy" (Broadbent, 1987, p. 79).

In sum, three debates have been discussed. The first debate concerns whether the processing system is limited or unlimited in capacity to process information. The limited capacity view rendered selection as selective processing. The unlimited capacity to process view opts for two different functions, i.e., selection as selection-for-action and selection as selection-for-memory. The second debate concerns how and where in the processing mechanism selections are made, i.e., at an early stage or at a late stage. For that, the computational solution suggests a winner takes all procedure that operates at an early level. The computational approach to selective attention recognizes the intentional guiding aspect to visual search, which it does by postulating different weights of importance that can be attached to individual stimuli. The third debate is concerned with the question whether the subject is in control or the world is in control over what is selected. Consumer research was not involved in these three debates. The reason is unclear, however.

THE ATTENTION SELECTION MODEL (ASM)

Based on the theoretical analyses so far it has become clear that there is no single model that explains the selectivity of attention for all attention phenomena. Here, we make an inventory of the various comments that have been produced on the various approaches to selective attention.

1. Broadbent's (1958) Filter theory is wrong but provides a useful approximation to what people *usually* do (Kahneman, 1973).
2. Kahneman's capacity theory of attention let us to abandon the idea that capacity limits are due to a scarcity of general, unspecific capacity (Neumann, 1987).
3. The resource concept has failed as an heir to Broadbent's channel capacity and Kahneman's unspecific capacity (Heuer, 1985; Neumann, 1987; 1996).
4. Treisman's Feature Integration Theory does not account for action as the function of vision (VanderHeijden, 1992)
5. Neither a structural constraint view or a functional strategic view by itself determines visual search patterns (Sanders and Donk, 1996)
6. VanderHeijden's (1992) postcategorical model of attention has not produced conflicting results, but does not account for all different kinds of attentional phenomena.

Two conclusions may be stated after the observation that no single model explains all attentional phenomena. First, there is no single model of attention. Second, a single model of attention that can be transferred to the consumer research area is better than a number of classic theories of attention that all can be criticized on inconsistencies. Therefore, an attempt will be made to propose a single model of attention that, theoretically, takes these inconsistencies into account and that may be applied in a consumer behavior context. VanderHeijden's model provides a valuable starting point, because it has not produced conflicting results. However, there are quite some pitfalls that may lead to the conclusion that this model does not provide an adequate approach of attention for the field of consumer research. We now turn to these pitfalls in order to find out if a solution is possible.

First of all, VanderHeijden's model is a structural model that is based on empirical evidence that does not go beyond a single eye fixation. As Sanders and Donk (1996) have argued, structural models follow the research tradition guided by the question which information is extracted during a single eye fixation. This implies that the stimulus exposure time does not exceed 150 milliseconds. It seems fair to conclude that this exposure duration and this model cannot provide the starting point for a theoretical approach of consumer attention mechanisms and processes as in consumer research stimulus exposure times range from a few seconds to self-selected exposure time.

A second point concerns the meaningless nature of the experimental stimuli. VanderHeijden used stimuli such as squares and circles to exclude memory variance. His model does account for spatial position and spatial relations, but it does not account for identity relations. Stimuli in consumer research experiments tend to be far from meaningless, however. This leads to the conclusion that his model cannot be regarded at the basis of an alternative model for a field in which stimuli are often meaningful.

A third pitfall concerns the pathways from the input map (IN) to the location map (LO) and to the identity domain (ID). These two pathways are based on studies in neuro-physiology. VanderHeijden suggested that "Visual information enters the central processing system in an 'input map' (the striate cortex?) (...) The information is sent on in an identity channel (the parvo channel) and a location channel (the magno channel)" (VanderHeijden, 1996, p. 31). Zeki (1993), a foremost researcher on the brain, explained in his book 'A Vision of the Brain' that supposing only two *cortical* visual pathways is an oversimplification with regard to the cerebral machinery involved in vision. The so-called 'what and where' doctrine supposes that these two cortical pathways are conceived as being mutually exclusive and hierarchically organized. One of these dual cortical pathways is thought to be specialized exclusively for 'form vision' or with 'what' an object is; the other pathway for 'spatial vision' or with 'where' an object is. These two cortical pathways originate from area V1 (the primary visual cortex or striate cortex) and are viewed as cortical prolongation's of pathways that are mediated by two sets of different layers of the lateral geniculate nucleus (LGN) and start from the retina itself and are known as the parvocellular or P and the magnocellular or M pathways. In turn, the parvocellular and magnocellular pathways have their origins in two different types of retinal ganglion cells: P and M type cells. Viewed from the retina, the P and M type cells terminate in the P and M layers of the lateral geniculate nucleus (LGN) respectively and are further relayed to area V1 that further connects to the 'what' and 'where' cortical systems (see Figure 8). "Hence, the fate of the two systems, the P and M on the one hand and the 'what and where' on the other, have become inextricably linked" (Zeki, 1993, p. 188).

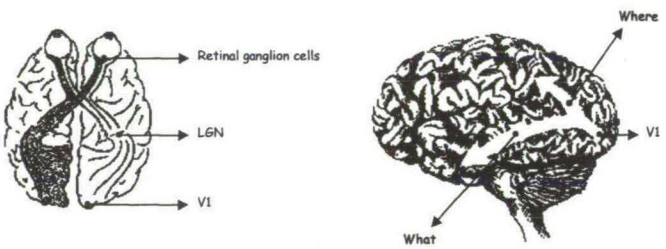


Figure 8: A diagram of the flow of information as conceived by Zeki (1993)

VanderHeijden based his model on the 'what and where' doctrine. According to Zeki, the 'what and where' doctrine that, though attractive in its simplicity, turns out to be invalid. Zeki concludes that "whichever way one turns, the evidence speaks against the kind of segregation into two separate, isolated and hierarchically organized systems [where and what], dealing with object [what] and spatial vision [where] respectively, that the doctrine seek to establish. (...) Perhaps a far better way to look at this system is to accept that each area will draw on any source to undertake its specialized task. Examples of one source of material providing material for another are common (...) The precise position of an object [where] and its relationship to other objects (spatial vision) can give the vital clue to the identity of the object [what], and the precise shape of an object [what] can give the vital clue to its position [where]" (Zeki, 1993, p. 194). In particular, Zeki's last point is in part recognized by VanderHeijden when he added the feedback loop from the location module (LM) to the input module (IN). Note that theoretically the implication Zeki suggests here is a second feedback loop, that is one from the identity module to the input module.

A fourth and a final point relate to the earlier discussed debate: when is attention selective? Here VanderHeijden acknowledges the point raised earlier by Prinz (1986) that experimental studies to selective attention are biased towards intentional tasks and required responses. VanderHeijden recognizes this point by the following quote.

> "And, because 'In practice, the observable criterion for successful 'attention' to (or awareness of) an environmental event invariably turns on the ability of the subject to act voluntarily, or, arbitrarily, in response to that event" (Allport, 1987, p. 408), as a devoted information processing psychologist, I especially looked for the effects of voluntary attention. But, and for me quite unexpected, still two different notions seemed to be involved in shifting compositions: two separate modes of control over the allocation of attention. Often not the subject, but the visual world seemed in control (...) still nowadays, passive involuntary attention is nearly completely neglected (...). In most experiments subjects receive an instruction. Then a stimulus is presented. Subjects are expected to be completely in control and have to behave as specified in the instructions. (...) In general, only a theory that acknowledges the existence and cooperation of attention, expectation and intention and, within attention, both the contributions of involuntary and voluntary attention, will be able to elucidate the real function of attention in visual information processing tasks. Both the subject and the world have to find their place" (VanderHeijden, 1992, p. 281/2)

It is noteworthy that, in contrast to visual perception research, consumer researchers seem to neglect the voluntary aspects of attention. That is why responses in consumer research are hardly required responses, but far more effectiveness responses. The combination of these points also lead to the conclusion that VanderHeijden's model is not a useful candidate for a single alternative model of attention.

VanderHeijden's theoretical notions (cf., Allport, 1987; Neumann, 1987) seem worth pursuing because the model has not produced conflicting results. However, because it does not fully account for all different kinds of attentional phenomena, the model must be extended if we are to accept it in consumer research as a valuable alternative to Filter theory, Capacity theory and Resource theory. Here, we will make an attempt to provide a solution to three problems simultaneously. First, it should be possible to falsify the extended model on empirical grounds. Second, we have to go beyond position relations by also accounting for identity relations. Finally, we should go beyond the domain of a single eye fixation by also accounting for visual search strategies. Sanders (1998) suggested similar ideas to this view. According to him, future research that aims to check VanderHeijden's theoretical notions will have to deal with less constrained conditions. As Sanders point out, studies should go beyond a single eye fixation and should add the relevant question if the identification module in his model is a *tabula rasa* when the stimuli are presented.

The attention-selection-model (ASM) proposed here builds on VanderHeijden's postcategorical model of attention in that it departs from the unlimited capacity to process information. The ASM captures the structure of VanderHeijden's model. The model can be specified as follows: Information enters the input map (IN) and is further relayed to two separate modules that undertake specialized tasks (Figure 9). The ASM denotes VanderHeijden's Identity Module (IM) as the Identity Conspicuity Domain (ICD) and the Location Module (LM) as the Location Conspicuity Map (LCM). The LCM is a saliency map just like the computational solution presented

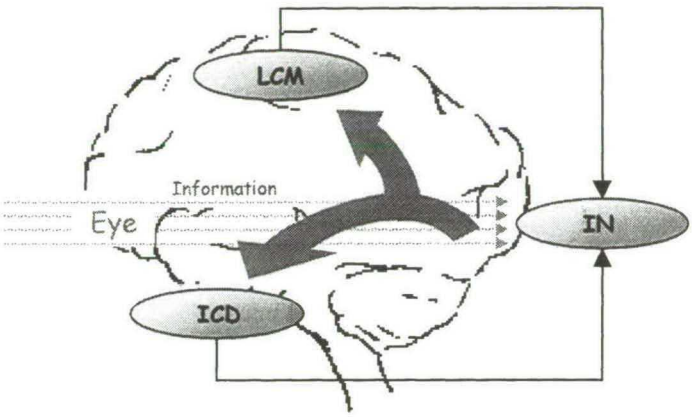


Figure 9: A diagram of the flow of information as conceived by DeHeer (this thesis)

earlier. A winner-takes-all (WTA) procedure cues the most conspicuous location in the visual scene. The most conspicuous location is based on the spatial relations between the items in the visual scene, i.e., where-relations. It is proposed here that also a similar WTA procedure cues the most conspicuous item in a visual scene on the basis of its identity or meaning. Just like the LCM the ICD is assumed to be a saliency domain. In the ICD item conspicuity is based on the identity relations between the present items, i.e., the what-relations. This proposal is consistent with Prinz (1986) who argued that the most conspicuous item vis-à-vis its contextual items can be simultaneously selected at the where (early) or what (late) level. At the LCM item conspicuity is based upon crude sensory features, such as contrast, brightness, color, outline, size, shape, movement, etc. vis-à-vis their contextual items. At the ICD item conspicuity is based on the (lack of) fit of its meaning with its surroundings - their placement vis-à-vis their context contrasts with expectations. Note here that the ASM captures and extends VanderHeijden's model. It captures his model by accounting for spatial relations between items in the visual scene; it extends his model by also accounting for identity relations between stimulus items. There are two feedback loops, (1) one from the location conspicuity map (LCM) to the input map (IN) (in a similar vein as VanderHeijden, 1992), and, proposed here, (2) one from the identity conspicuity domain (ICD) to the input map (IN) (as suggested by Zeki, 1993). Again note here that the ASM extends VanderHeijden's model by the second feedback loop. The operation of the feedback loops can be regarded as selective attention triggered by position information and / or by identity information. The map of locations and the domain of identities are the *sources* of the attention. Both location information - if fed back to the input module - and identity information - if fed back to the input module - *is* the attention. We therefore propose that the operation of the feedback loops have functions in the selection of identified information and in the selection of localized information. Conceptually attention is defined as the selector of localized and identified information in the function of memory storage and action.

So far, the ASM is a structural model based on the unlimited capacity to process and accounts for early selective cuing and for late selective cuing. Early selective cuing takes place at the level of the location conspicuity map (LCM), and late selective cuing takes place at the level of

the identity conspicuity domain (ICD). Early selective cuing at the LCM level is associated with spatial relations (where-relations) between stimulus items and late selective cuing at the ICD level is associated with identity relations (what-relations) between stimulus items. At both levels all items that make up the visual scene are important. Conspicuity is calculated by a winner-takes-all procedure, and is based on the relations between individual items present in the visual scene.

It is proposed here that the most conspicuous item (either at the where or what level) in a visual scene is cued for an effectiveness response (selection-for-memory) in the case of unintentional acts. In other words, we propose here that the default value of the visual system is build to select the most conspicuous item in a visual scene. In the case of goal-directed or intentional acts, the subject is in control to attach weights to individual items that make up a scene irrespective of their conspicuity (that is conspicuity based on the where or what item relationships). In principle, the subject is able to overrule the default value of the system in the case of intentional acts. In other words, the ASM is a structural model that allows for strategies. 'Structural' refers to the way in which the visual processing system is organized, and 'strategies' refer to the external or internal control within the system. Two visual search strategies are distinguished: intentional or goal-directed visual search and unintentional or exploratory visual search.

The ASM, in the tradition of the assumed functional relationship between perception and action, considers two functions for selection, i.e., selection-for-memory and selection-for-action but does not consider selection-for-processing [3]. Earlier we associated selection-for-memory with the effectiveness response, and selection-for-action with the required response. It is hypothesized that the most conspicuous item (either at the LCM level or at the ICD level) in a visual scene has a higher probability to be selected for memory storage when the subjects' task is unintentional, i.e., performs an exploratory visual search task. In other words, conspicuous items in a scene increase memory accuracy, and therefore are more effective in terms of memory storage as compared to inconspicuous items. In the case of a goal-directed visual search task, it is suggested that all items present at the same time in a visual scene have equal selection probabilities to be stored for memory. Note that this latter case holds if there are more items in the scene, and subjects have not been specifically instructed to use some kind of selection criterion, i.e., to set weights of importance for any specific item. For example, by instructing subjects that all items are equally important and no one in particular.

3 Recently (see Deubel, Schneider & Paprotta, 1998 for references), various other models of attention have been postulated based upon the where and what pathway, for example, the Visual Attention Model (VAM) by Schneider (1995). The VAM also suggests a common selection mechanism for both processing streams. The VAM considers both processing streams limited in capacity and considers the function of the what-pathway as selection-for-perception, and selection-for-action is considered the function of the where-pathway. ASM and VAM are similar concerning selection in both the where and what pathway. The VAM is in the tradition of the classic approaches to visual attention in contrast to the ASM. The ASM and VAM differ in one important aspect, i.e., ASM does not consider selection-for-processing in contrast to VAM. Also, VAM aims to examine of there is a unitary selection mechanism that operates in both pathways. The question if multiple attentional selection centres versus one unitary selection centre exists, is beyond the scope the ASM.

In sum, the ASM is characterized by:

1. Its structure consisting of an Input map (IM), Location Conspicuity Map (LCP), and an Identity Conspicuity Domain (ICD);
2. Its account for spatial relations between items and identity relations between items in a visual scene;
3. Its allowed strategies, i.e., goal-directed visual search and exploratory visual search;
4. Its assumption with respect to unlimited capacity to process information, and to the functionality of selection in the control of action (selection-for-action) and memory storage (selection-for-memory); and,
5. Its differential effect on the a priori selection probability of items based upon the strategy involved.

The ASM contrasts VanderHeijden's model by:

1. Its account of identity relations (the identity module is not a tabula rasa);
2. Its account for both intentional and unintentional tasks; and,
3. Its assumption of visual search strategies (that is, the ASM goes beyond single eye-fixations)

These differences between the models are functional because we have concluded that VanderHeijden's model cannot provide the starting point for a theoretical approach of consumer attention mechanisms and processes. In contrast, the ASM overcomes the pitfalls we have illustrated earlier with respect to his model. In brief,

1. The ASM allows for longer stimulus exposure durations;
2. The ASM allows for meaningful stimuli;
3. The ASM is in line with recent neurophysiological evidence; and,
4. The ASM accounts for initiatives taken by either the subject or the outside world.

In conclusion, the ASM explains *why* (unlimited capacity to process; selection-for-action; selection-for-memory), *how* (the WTA procedure at the location conspicuity map level and at the identity conspicuity domain level), and *when* (exploratory visual search and goal-directed visual search) a particular item (among other items in a visual scene) may sort an effectiveness response, i.e., be stored in memory.

CHAPTER 3: TOWARDS A NEW METHODOLOGY

Chapter Introduction

This chapter develops and proposes the serial multi item recognition (SMIR) task as the appropriate task to test the attention-selection-model (ASM) outlined in chapter 2. Further, it deals with the experimental design, the hypotheses and the procedures that were followed to collect the empirical data.

Researchers in the area of visual attention use many variations on a limited number of different tasks, viz. filtering tasks and monitoring tasks (Pashler, 1998). VanderHeijden's model is based on findings from filtering tasks (Theeuwes, 1992). We start of with reviewing three variants of filtering tasks. More specifically, pros and cons of the whole report, partial report and the rapid serial visual presentation (RSVP) task are discussed. The SMIR task combines a report task and a rapid serial visual presentation (RSVP) task. In the larger context of consumer research, it is important to note that the SMIR task is built as such to generalize it easily to more real life consumer environments.

Report tasks

In general, in a report task experiment subjects are briefly shown a visual stimulus containing a number of items (e.g., letters or digits) and are instructed to report as many of these items as possible immediately after each stimulus offset. This task can be regarded as a multiple-item task because at the same time multiple items are presented simultaneously. Basically, two variants of the report-task have been used frequently in experimental psychology: the whole-report task (Mackworth, 1959, 1962, 1963) and the partial-report task (Sperling, 1960, 1963, 1967). In the whole report task the subject is required to report as many items from the total number of exposed items. In the partial-report task subjects have to report only a particular sample from the total number of items presented that satisfies a selection criterion (given by instruction) about the nature of the stimuli.

In order to explain this type of data, a simple serial two-store model for visual information processing was postulated (VanderHeijden, 1996). The visual representation was put in the first store and reflects what the subject sees. Identified items were put away in the second store and reflects what the subject knows. In essence, the whole-report task examines the capacity of the second store and the partial-report task examines the capacity of the first store (VanderHeijden, 1996).

Another important difference between the whole-report and the partial-report task is the moment of instruction given to the subjects. In the whole report-task subjects are instructed *before* the experiment starts. In the partial report task the time of instruction can be given at any moment *before*, *during* and *after* stimulus presentation by a so-called coded instruction. In a whole report task, subjects are confronted with, for example, a matrix of 3 x 3 stimuli. After the matrix is taken away, they are to report as many stimuli as possible. No selection criterion about the nature of the stimuli is provided. In the partial report task, the same matrix is presented and taken away without any support being provided. Before, during or after

presentation, a tone is presented of which the pitch indicates whether the subject is to report the top row, the medium row or the lower row of stimuli. The tone pitch specifically refers to the type of response that is to be given.

Independent of the moment of instruction stimulus retrieval [4] is observed to be superior in the partial report task as compared to the whole report task. This result can not be attributed to stimulus characteristics because stimuli were selected on the basis of their equivalence in physical appearance and cognitive connotations. According to Sperling (1960, p. 21) 'information is initially stored as a visual image (...) Ss can effectively utilize this information in their partial reports'.

Rapid Serial Visual Presentation (RSVP) task

The whole-report and partial-report tasks have in common that after stimulus presentation (and instruction) the responses of subjects are collected. An example of a technique where subject responses are not collected after each stimulus presentation but after all stimuli have been presented is the Rapid Serial Visual Presentation (RSVP) task. In the RSVP task a sequence of items is presented in a rapid rate, one after another, at the same retinal position. This task can be regarded as a single item task because, at each moment in time, only one item is presented. Thus, the RSVP task differs with respect to the whole-report and partial-report in two ways. First, in the RSVP task items are presented in series one by one versus multiple items at one time in the whole-report and partial-report task. Second, in the RSVP task subjects' responses are collected after all stimuli have been exposed to the subject versus the whole-report and partial-report task where responses are collected after each stimulus presentation (after each trial). Just like the partial-report task the RSVP task allows for the possibility to vary the moment of instruction. For example, in Eriksen & Collins' (1969) RSVP task the digit series 1 to 9, with one out of nine digits missing, were briefly presented. In an instruction before stimulus presentation condition subjects were told a digit name prior to each trial. The task was to determine whether it was presented or not. In an instruction after stimulus presentation the name of the target digit was given after all stimuli were presented. So, the task here was to look for the gap in the series. The unique feature of the RSVP task, of course, is that there is no uncertainty with regard to spatial position; all items are presented on the same spatial position. Table 5 summarizes the differences between the report tasks and RSVP task.

TABLE 5: Differences between Report and RSVP tasks

Whole/Partial report	RSVP
Multiple items parallel	Single items serial
Spatial uncertainty, in principle	No spatial uncertainty
Response collection after each single stimulus presentation (after each trial)	Response collection after all stimuli presentations (after all trials)

4 Consumer research denotes this type of stimulus retrieval as (unaided) recall and the data are usually depicted as number of items recalled. Perception researchers often speak of the accuracy the stimuli are recognized, hence the data are reported as recognition accuracy. Consumer research speaks of recognition or aided recall in the case earlier exposed stimuli (seen items) are responded as has seen (that is, known) in a second exposure when the subjects response is required.

Towards the Serial Multiple-Item Recognition (SMIR) task

The partial report and RSVP tasks both allow for instructing the subjects how to act and where to act upon after stimulus presentation. In this particular case, it is argued here that during stimulus presentation selective attention reveals itself by default. In other words, if there is no specific goal or intention to perform the task, then the world (stimulus environment) is in control and the default value of the visual system selects the most conspicuous item for memory storage. One of the important differences between the partial report and RSVP relates to the moment of response collection. For the RSVP the response(s) is/are collected after all stimuli have been presented. In contrast, response collection in the partial report task takes place after each stimulus presentation. The important point here is that in the partial report task just one trial turns the unintentional task to an intention or goal-directed task even though subjects still do not know where to act upon. The RSVP task becomes goal-directed in the case when it is presented to subjects for a second time. If the researcher wants to study unintentional acts in a series of stimulus exposures then the RSVP task (instruction afterwards) is suggested over the partial report. On the other hand, the RSVP task presents single items in series at fixed positions in the visual scene, while the report task presents multiple items in parallel at random positions in the visual scene. If the researcher wants to study conspicuity effects (as defined in this thesis) on memory accuracy then s/he should expose subjects to multiple items and allow for spatial relations between the items. In the case of examining conspicuity effects on memory accuracy, the report task is the appropriate task. Yet, the attention-selection-model wants to study both selection-for-memory under intentional and unintentional task instructions, and wants to study spatial relations between items and identity relations between items. In other words, the appropriate task to test the ASM should meet the following requirements: (1) its account for spatial relations between items, (2) its account for identity relations between items, (3) its account for spatial uncertainty, (4) its account for different task instructions. Therefore and because of these reasons we here propose a task that combines the report and the RSVP task. The combination of the report task and RSVP task results in the selection of a more complicated technique: the Serial Multiple-Item Recognition (SMIR) task.

The spatial layout of the visual scene is depicted in Figure 10. The visual scene consists of forty squares (5 rows x 8 columns). At each stimulus exposure in each of four adjacent squares (upper left, upper right, lower left, and lower right) a word [5] is presented. In other words, at each stimulus exposure 4 items are presented simultaneously. Thus, 4 words make up one stimulus. The SMIR contrasts the RSVP by the presentation of multiple items instead of a single item at one time. Second, the SMIR contrasts the RSVP by the random locations in the visual scene. The number of spatial positions at which a stimulus can appear is 28 (4 (rows-1) times 7 (columns -1)). The stimuli appear at random locations within the visual scene. Note that the RSVP presents single items at the same location. In contrast to the RSVP, there is uncertainty about the location of the stimulus in the SMIR task. In the experiments described in this thesis, subjects

5 To illustrate why the ASM model and the proposed SMIR task may be fruitful and may make a difference to our current thinking about consumer behavior, let us take a well-known general behavior phenomenon as an example. More specifically, let us consider a consumer standing in front of shelves with different brands or with a consumer that is simultaneously exposed to a number of print ads in a magazine or newspaper. The SMIR is built so that the artificially visual scene (a matrix of 8 x 5 squares) may be associated with real shelves is a supermarket, with a newspaper or magazine, and with the spatial layout of an Internet homepage for a business in e-commerce. The products, brands, ads and the like are operationalized by the words placed in the squares. In this study the words presented are brand names.

are exposed to a series of 56 stimuli. Therefore, the total number of words is 224 (56 trials times 4 words). The stimuli are briefly exposed (0.5, 1, or 2 seconds; depending upon experimental condition). The time interval is fixed at one second. The task given to the subjects is relatively simple but specific: "press a button on each stimulus onset as quickly as possible". Immediately after all stimuli are presented a recognition task follows, in which one word at the same time is presented on the screen. Here the SMIR contrasts the report tasks in which responses are collected after each stimulus presentation. The response of interest here is recognition accuracy, not reaction time. Subjects are required to press either one of two buttons (yes or no) if they saw that word in the SMIR task. This is done for 448 words; 224 words appeared as stimuli and 224 other words not.

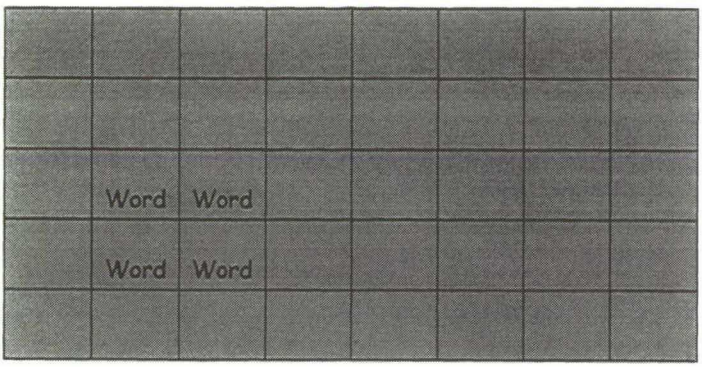


Figure 10. The spatial layout of the SMIR task

Overall conclusion

In sum, the theoretical analysis (Chapter 2) proposed the attention-selection-model (ASM). The structure of the ASM accounts for spatial relations and identity relations between items present in a visual scene. The strategies allowed by the structure of the ASM were denoted as goal-directed or intentional visual search and exploratory or unintentional visual search. Further, the ASM argued that the default of the visual processing system was directed to select the most conspicuous item at either the where-level or what-level during unintentional acts. The most conspicuous item is cued by a winner-takes-all procedure and is considered selected for memory storage. On the other hand, if the task is goal-directed, it is assumed that, with multiple items in the visual scene, in principle any item can be the candidate for memory storage. That is when the instruction does not explicitly set the selection criteria regarding the nature of the words in the stimulus.

Our methodological analyses revealed that the report (whole and partial) task and the RSVP task are both important methodologies in the study of attentional phenomena. Each task presents the stimuli in its own way (single items in series versus multiple items in parallel) and collects the responses at different times (after each stimulus trial versus after all stimuli trials). It is argued that specific parts from each task need to be combined to test the ASM. Because of the requirements such as spatial uncertainty, location and identity relations between stimulus items both report and RSVP task were combined and resulted in the SMIR task. The serial multiple-

item recognition (SMIR) task combines the report task (that is, position uncertainty, multiple items) and the RSVP (that is, response collection after all stimulus trails) in one methodology. The SMIR task proposed here aims to test the ASM empirically. Further, the SMIR task is easily transposed to more real consumer environment situations (see footnote 5).

Goal of the study

The central research question concerns the internal mechanisms that make selective attention possible. The approach we followed is consistent with the information processing approach. The information processing approach "tries to infer aspects of the internal structure and functioning of a behaving organism from the overt behavior of that organism, so that it becomes possible to explain the organism's behavior in terms of its internal structure and functioning" (VanderHeijden, 1992, p.2).

The ASM accounts for visual search strategies (exploratory or unintentional visual search and goal-directed or intentional visual search) and the structure of the ASM predicts enhanced selection-for-memory probabilities regarding conspicuous items in the visual scene. Selective attention shows up as superior in recognition performance.

The items in the visual scene

The four words that make up one stimulus were not arbitrarily chosen. One out of the four items, i.e., one out of four brand names is manipulated so that it is conspicuous vis-à-vis the other three brand names. In total 224 (4 brand names times 56 trials) familiar brand names were carefully selected. Two independent types of brand name conspicuity are distinguished: *visual brand name conspicuity* and *cognitive brand name conspicuity* (e.g., Engel, 1977). Visual brand name conspicuity is understood as the degree of perceptual prominence of a visible brand name in its context. Visual conspicuity is based upon crude sensory features, such as contrast, brightness, color, outline, size, shape, movement, etc. Cognitive brand name conspicuity is taken as the degree of cognitive prominence of a visible brand name and is based on the (lack of) fit of its meaning with its surroundings. Cognitively conspicuous brand names are not necessarily new, but their placement vis-à-vis their context contrasts with expectations.

Two independent types of brand name conspicuity make up four conspicuity conditions. A (target) brand name can be (1) inconspicuous, (2) visually conspicuous but not cognitively conspicuous, (3) cognitively conspicuous but not visually conspicuous, and (4) both visually conspicuous and cognitively conspicuous vis-à-vis its contextual brand names (see Table 6). Figure 11 translates the conspicuity conditions in the operationalizations as visually depicted in the spatial layout of the SMIR task. Figure 11 shows the letters A and B, which refer to brand names. Brand names denoted as A are derived from the same product category, e.g., are all beverages. The brand name denoted as B is from a different product category in comparison with A, for example, cars. In this example, B is the cognitively conspicuous brand name. A white background versus the gray background for the contextual brand names operationalizes visually conspicuous brand names.

TABLE 6: The conditions of brand name conspicuity

Condition	Visually conspicuous vis-à-vis contextual brand names	Cognitively conspicuous vis-à-vis contextual brand names	Brand name (denoted as)
1	No	No	VoCo
2	Yes	No	V+Co
3	No	Yes	VoC+
4	Yes	Yes	V+C+

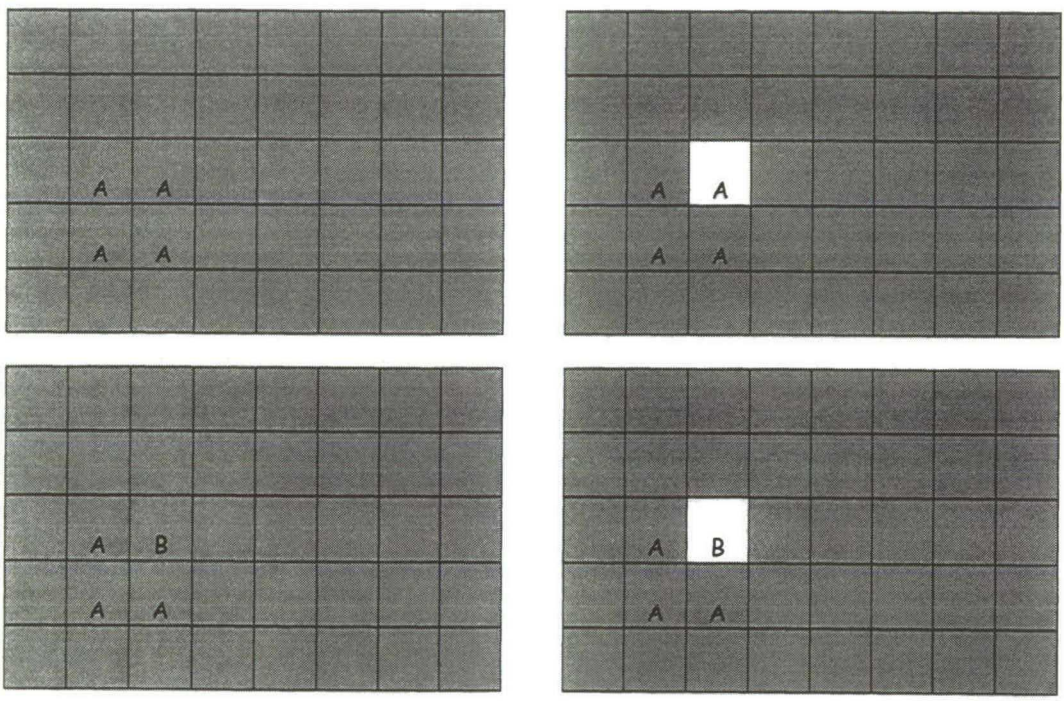


Figure 11. The spatial layout of the SMIR task. The conditions: Top left VoCo; Top right V+Co; Bottom left VoC+; Bottom right V+C+.

We have distinguished two types of visual search strategies. It is assumed that subjects either follow an exploratory visual search or a goal-directed visual search strategy. We manipulated visual search in the following way. The subjects were instructed to press a button as quickly as possible at each stimulus onset. Our cover story was that we were interested if subjects were able to maintain their reaction times consistently in a series of stimuli exposures. Note that we instructed the subjects about the specific action that is required and we have informed the subjects how to act (press the button) and where to act upon (stimulus onset). What is important to observe here is that the required response is pressing the button, which is entailed by the selection-for-action view. The instruction does not inform the subject about the real purpose of the experiment. The real purpose is to examine if the conspicuous brand name in the visual scene has a higher probability to be selected for memory storage, i.e. the second function

of selective attention (selection-for-memory view). Higher recognition accuracy for conspicuous brand names as compared with the contextual brand names indicates that selective attention revealed itself. Because it is the stimulus onset that triggers the reaction time response we assume that subjects in this condition examine the brand names in an exploratory and unintentional manner. In other words, in this case subjects adopt the exploratory visual search strategy. Subsequently, after all 56 stimuli were presented, a recognition task followed, in which one brand name at one time was presented on the screen. Subjects were instructed to press either one of two buttons (yes or no) indicating if they had seen that particular brand name or not in one of the previous exposures. Subsequently, after the recognition memory task, exactly the same procedure was repeated for each subjects. Subjects were required to perform the same task for a second time. The instruction for the second time was exactly the same as the first time. There is one important difference: we implicitly induced a second goal, i.e. brand name recognition. So, now subjects had two goals. The first is to give a fast but consistent reaction time, and the second is to remember as many brand names. It is assumed that subjects this second time are more goal-directed towards the brand names. In other words, in this case subjects adopt the goal-directed visual search strategy. Subjects now know how to act (give reaction times as quickly and consistently as possible, and remember brand names), but they still do not know which specific brand names to remember. In other words, there is no specific selection criterion regarding the nature of any particular brand name to act upon (e.g., the most conspicuous one, the most interesting one, the one that is most personally relevant, the one that sounds great, etc). In other words, there is no a priori or specific target communicated to which the action should be directed, therefore, each brand name is a potential target for action (and memory storage). The argument is made here that in this particular case subjects deliberately may choose one but not one in particular. In other words, any brand name goes. In sum, in task 1 subjects exploratorily examine the stimuli and the default of the attention selection mechanism selects the most conspicuous brand names for memory. In task 2 subjects adopt a goal-directed search strategy, which implies that any brand name can be the candidate for memory storage but not necessarily the most conspicuous brand, depending upon the individual subject's goal orientation.

Consumer research versus Visual Perception research

One important point deserves some more attention and concerns the difference between consumer research studies and visual perception studies. It is recognized that the following distinction is very broad and general. However, it is believed to be relevant to the present discussion. In general, visual perception experiments are characterized by (1) intentional tasks, (2) required responses, and (3) explicit selection criteria regarding the nature of the target stimulus. These points are inherent in the instruction given to the subjects, i.e., the subject knows how to act (e.g., press the button) and what to act upon (e.g., the red item among greens or the letter among digits). Further, this type of research is also characterized by the fairly short stimulus exposure durations in the range of 50 milliseconds - 1 second. In contrast, consumer research is, in general, characterized by (1) unintentional tasks, (2) effectiveness responses, and (3) no explicit selection criteria. In general, the instruction given to the subject is very broad like "we are interested in what you think about a series of advertisements that will be presented to you". In consumer research, the factor exposure duration is a critical factor in need for careful consideration. Yet, the choice for a particular level of exposure duration in

advertising research often seems determined by subjective criteria, which usually are not communicated by the respective researchers. Instead, there seems to be a rather broad range within which the manipulated or allowed exposure durations may fall, and from which a seemingly random and ad hoc sample seems to be made. By consequence, exposure time is not systematically varied, nor are comparisons allowed between studies. To complicate matters even more, some authors use self-selected exposure durations by subjects or viewing time to infer, for example, the level of message elaboration, thereby risking the confusion of confusing cause and effect. Stimulus exposure durations in consumer research vary, in general, between 1 second and 30 seconds. Table 7 summarizes the differences between consumer research and visual perception research.

TABLE 7: Differences between studies in visual perception and consumer research

Visual perception	Consumer research
Selection-for-action	Selection-for-memory
Stimulus duration range [50ms - 1 sec]	Stimulus duration range [1 sec - 30 sec]
Intentional tasks	Unintentional tasks
Specific selection criteria instructed	No specific selection criteria instructed
Required response	Effectiveness response

An important conclusion may be stated after this observation: both areas lack a specific type of response, i.e. consumer research lacks the required response and perception research lacks the effectiveness response. There are two possibilities we might consider. First, typical consumer research studies should be extended to account for intentional tasks. Second, visual perception research should be extended to account for unintentional tasks as well. The first option suggests that consumer research should also be concerned with required responses, and the second option suggests that perception research should also be concerned with effectiveness responses. Given the complexity of the stimulus material (remember VanderHeijden's notion about studying real world phenomena), it seems premature at this point to opt for the first option. Therefore, the approach taken here is to study selective attention in a rather typical visual perception experiment (with some methodological variations, and by using meaningful stimuli) under both conditions of intentional and unintentional behavior. It is recognized that the more hard-to-collect evidence of the other type as sketched above must parallel this rather easy-to-collect type of research, otherwise we do not get the full picture.

With respect to the factor exposure duration we opt for the point of intersection between consumer research and visual perception research. The reason is that we want to join consumer research and visual perception research, because of the gap between the very short and relatively long exposures used by the separate disciplines. Therefore, the stimuli exposure durations used in this study are in the range of 1 second. In fact, three different stimulus exposure durations are used: 1 second, a factor 2 less (0.5 seconds), and a factor 2 more (2 seconds). The reason that we use fixed durations is because we aim to compare brand names conspicuity effectiveness between related experiments. These relatively short exposure durations do not contradict our earlier conclusion regarding the pitfalls with respect to VanderHeijden's model. VanderHeijden (1992) based his model on studies with stimulus exposure durations of less than 150 milli seconds. Here we go beyond that by using longer durations. Also the relatively short durations chosen here are not completely contradictory with exposure

durations in consumer research. Recently, there seems to be an increasing interest within the area of consumer research to examine the effects of briefly and initially exposed brand names on the probabilities for inclusion in the consideration set to choice (MacInnis, Shapiro, and Heckler, 1992; Janiszewski, 1988).

The Theory - Methodology link

One final comment should be made regarding the link between the ASM and the chosen experimental method effectuated by the SMIR. If we assume that the ASM is in principle correct then the question about its falsification immediately follows. Basically any task that meets the following requirements is appropriate to falsify the ASM on empirical grounds. Tasks should account for (1) spatial relations between items, (2) identity relations between items, (3) spatial uncertainty, and (4) different task instructions. It is outlined that the SMIR does meet these requirements. In the larger context of consumer research (for which the ASM is proposed) it is also important that a laboratory type of task is generalizable to realistic consumer environments. Though it is possible to critically test the ASM by a number of variant tasks, the SMIR, in particular, accomplish the latter within the larger context of consumer research. In addition, the stimulus material has been chosen carefully to examine whether the conspicuous brand names vis-à-vis their contextual brand names does have higher memory selection probabilities. The ASM proposes that conspicuous items in a visual scene under unintentional tasks are selected by default for memory storage. In fact, throughout this thesis it has been argued that the conspicuous items in a visual scene have higher selection probabilities. This seems reasonable because it is consistent with earlier findings for the visually conspicuous items and/or with suggestions for the cognitively conspicuous items. A more conservative point of departure might be considered given the nature of the stimulus material. So far, the literature has not described studies that explicitly examined memory accuracy effects for brand names that are exposed simultaneously at one time. Let alone the manipulations and operationalizations of visually and cognitively conspicuous brand names. For example, to manipulate a brand name's visual conspicuity we used contrast (target on a white background versus the contextual brand names on gray backgrounds). Instead of contrast we could have used, for example, different colors or luminance for target and flanking brand names. Therefore, there are two possibilities we might consider. First, we might depart from the conservative view that argues that the recognition accuracy differs between the target and contextual brand names. Secondly, we might take a more progressive stand and depart from the targets' higher memory selection probabilities as compared to the contextual brand names. There is advantage for the first option over the second given the (1) explorative nature of this type of research, (2) the meaningfulness of the stimulus material, and (3) the one (arbitrary) manipulation chosen for the brand name conspicuity manipulations. On the other hand, memory effectiveness is expected to increase and not decrease for the conspicuous brand names.

Hypotheses

The foregoing leads to the following hypotheses.

Hypotheses for the exploratory visual search condition in which the conspicuous brand names serve as pre-defined targets:

H1:
Target brand names that are inconspicuous to the contextual brand names have equal selection-for-memory probabilities under the unintentional and exploratory visual search strategy. Operationally, we expect to find that memory accuracy for a pre-defined target brand name is equal to the memory accuracy for its contextual brand names.

H2:
Visually conspicuous brand names have a higher selection-for-memory probability as compared to their visually inconspicuous contextual brand names under the unintentional and exploratory visual search strategy. Operationally, we expect to find that memory accuracy for a visually conspicuous brand name is higher than the memory accuracy for its contextual brand names.

H3:
Cognitively conspicuous brand names have a higher selection-for-memory probability as compared to their cognitively inconspicuous contextual brand names under the unintentional and exploratory visual search strategy. Operationally, we expect to find that memory accuracy for a cognitively conspicuous brand name is higher than the memory accuracy for its contextual brand names.

H4:
Brand names that are visually+cognitively conspicuous have a higher selection-for-memory probability as compared to their visually+cognitively inconspicuous contextual brand names under the unintentional and exploratory visual search strategy. Operationally, we expect to find that memory accuracy for a visually+cognitively conspicuous brand name is higher than the memory accuracy for its contextual brand names.

Hypotheses for the goal-directed visual search condition:

H5:
Visually, cognitively, and visually+cognitively conspicuous brand names have an equal selection-for-memory probability as compared to inconspicuous brand names (contextual brand names) under the intentional or goal-directed visual search strategy. Operationally, we expect to find that memory accuracy for those conspicuous brand names are equal to the memory accuracy for their contextual brand names.

Experiments

All experiments have the same format and share the same approach. The reason is that we want to study the dynamics of selective attention and the effectiveness of brand name conspicuity systematically. It is important to note that there are two ways to interpret these experiments: as one overall experiment containing 10 separate conditions, or as a design consisting of 10 related experiments. The latter option is preferred over the first because the experiment is especially designed to study conspicuity effects in interaction with stimulus exposure duration as well as in isolation from stimulus exposure duration. Yet, instead of describing each experiment separately, the general outline of all experiments is described here.

Subjects

In total, 250 first-year undergraduate psychology students [6] from Tilburg University participated in the experiments on an individual basis. Subjects were randomly assigned to one of ten experiments (N=25 per experiment). Subjects did not participate more than once. Subjects received credit points for their participation as part of course requirements. All subjects had normal to corrected normal vision and visual acuity. None of the subjects were familiar with either the paradigm or the goal of the experiment. Subjects were carefully debriefed not to tell others about the experiment.

Stimuli

In total 448 brand names were used as stimulus material in this study. From these 448 brand names, 224 were actually presented in the visual search tasks. The other 224 brands served as decoys for the recognition task, in which 448 brand names were presented. We assumed that all brand names were familiar to our subjects. The reason we used familiar brand names is obvious because otherwise a brand name can not be cognitively conspicuous vis-à-vis its contextual brand names. A stimulus example is provided in table 8. [7] See Appendix A for the brand names used during the search tasks.

TABLE 8: An example of the brand names for each conspicuity condition

Condition	Context	Target	Context	Context
1: VoCo	Dodge	Ford	Chevrolet	Chrysler
2: V+Co	Dodge	Ford	Chevrolet	Chrysler
3: VoC+	Dodge	Snickers	Chevrolet	Chrysler
4: V+C+	Dodge	Snickers	Chevrolet	Chrysler

Apparatus

The experiment was performed with an Olivetti P90 PC with a 17" NEC monitor. In order to avoid glare on the screen, the lights in the room were dimmed. Each subjects' chin was placed in a chin-rest to keep their viewing distance at 50 cm. A button-box was used to give the reaction-time responses (the measurement of the RT's was beyond the goal of this thesis. In fact, none were measured).

6 Details about subject sample is available by author on request.

7 Note that this is an example using US brand names. In the study only Dutch brand names were used.

Procedure

The experiment consisted of three phases: (1a) the exposure to the stimuli followed by (1b) a not-expected recognition task, (2a) a repetition of the first phase with the major difference that the (2b) recognition task was expected the second time, and (3) a questionnaire. The participants were instructed to press a button at each stimulus onset as fast and as consistently as possible. It was explained that each stimulus consisted of four brand names and that all stimuli appearances required the button to be pressed. Further, it was explained that on each of 56 trials the stimuli could appear at random locations within the 8 x 5 matrix. Stimuli locations were randomized and on each of 28 possible locations a stimulus was presented twice. The location of the pre-defined target (left up, left down, right up, right down square) was randomized as well so that the predefined targets were equally distributed over the positions. The serial order of stimulus trials was not varied between conspicuity conditions and subjects. In other words, the stimulus order was fixed. Immediately after all 56 stimuli exposures, the subjects were confronted with a recognition task. In the recognition task brand names were presented on the monitor individually at a time. Subjects had to judge whether that brand name was previously presented or not; they did so by pressing the appropriate button. This was done for 448 brand names (56 stimuli x 4 brand names = 224 listed brand names and 224 not-listed brand names). After the recognition task the second phase started. The second phase equaled the first phase that is, exactly the same instruction was given, the same stimuli were exposed, and the same recognition task had to be performed. We like to stress that the subjects had no idea about the nature and goal of the experiment. Their comments afterwards suggested that they thought the researcher was interested in the difference in recognized brand names between the two exposures since in the first phase the recognition task was unexpected and in the second phase the recognition tasks was expected. Finally, in the last phase subjects had to fill in a questionnaire. The questions related to (1) the familiarity of the brand names, (2) if brand names were personal relevant, (3) brand experience, (4) the intention aspect to perform the two tasks et cetera. These questions served as manipulation checks (e.g., (un)intentional acts, known brand names) All subjects were tested individually. The total time to test one subject was approximately 1 hour (instruction 5 minutes, task 1 15 minutes, task 2 15 minutes, questionnaire 25 minutes).

A point that needs to be discussed is a possible critique [8] on the experimental design that might be the risk of a sequence or transfer effect that might contaminate the brand name conspicuity manipulation. It could be argued that the recognition task, which follows the first series of stimulus exposures should be considered the experimental treatment in the design and that the treatment manipulates the search strategy, i.e., subjects become goal-directed. If the argument is valid a typical pretest-posttest should be conducted. To make sure that the obtained effects of the second recognition task can be attributed exclusively to the real experimental manipulation (brand name conspicuity), one should include a control group to exclude the plausible rival hypothesis, concerning a sequencing effect. If the sequence effect occurs then this would amount to an inseparable effect of carry-over and brand name conspicuity in the recognition scores. These effects cannot be separated from one another without the inclusion of a control group. We did not include a control group, however, for reasons to be explained below.

8 The author thanks an anonymous reviewer for his helpful comments on this point.

First, the suggested pretest-posttest design with a control group is not possible. If the pre-response measure in our design (the first recognition task) is considered the treatment than this suggests that no responses can be collected for the control group after the exploratory search condition. The treatment effect cannot be assessed by comparing the difference measures between the experimental group and control group, simply because there are no pretest scores available for the control group. One may compare the posttest-scores between the experimental and control group but the possibility of a sequencing effect for the experimental group still holds. In other words, a pre-posttest including a control group as was suggested by the reviewer does not seem to exclude the rival hypothesis.
Second, it may be argued that the first recognition task should not be considered the experimental treatment. On the contrary, it is the subjects' expectation that a second recognition task would follow, which altered the visual search strategy, i.e., from exploratory to goal-directed search.
Third, there is no reason a priori to expect a carry-over effect because the randomization procedure [9] (stimulus order, stimulus location, target position over subjects, experimental conditions, and first and second series exposures) highly decreases the possibility of carry-over effects. If and only if the second recognition scores include carry-over effects from the first recognition assessment, then the effects are equally spread over all experimental conditions and do not systematically affect the results. It may, therefore, be hypothesized that any conspicuity effects found for the exploratory visual search condition are captured and equally extended (whatever direction) in the recognition scores for the goal-directed visual search condition. We return to this point in the discussion section.

9 The order in which the 56 stimuli were presented was randomized over subjects, experimental conditions, and first and second series exposures. The locations of the stimuli in the visual scene (in principle, each stimulus could appear on 28 different locations) was randomized over subjects, experimental conditions, and first and second series exposures. The position of the target within the stimulus (upper left, upper right, lower left, and lower right) was randomized over subjects, experimental conditions, and first and second series exposures. Both the stimulus location and target position randomization procedure made sure that the location of the stimuli were equally distributed over the 28 possible locations and the position of the target was equally spread out over the 4 possible positions. Hence, a stimulus appeared twice at each location in the visual scene and targets appeared 16 times at each possible target position.

CHAPTER 4: RESULTS, DISCUSSION AND CONCLUSIONS

Empirical results

Manipulation checks

Three manipulation checks were conducted, one with respect to the subjects' familiarity with the brand names, the second regarding the operationalization of the conspicuous brand names, and the third one concerned the visual search strategy manipulation. The data for the manipulation checks were taken immediately after the recognition accuracy data collections by means of a questionnaire. For the brand names familiarity check each subject simply reported if they were familiar with the individual brand names or if they were not. These assessments were taken for the 224 exposed brand names. Subjects had also to choose the most conspicuous brand names out of 4 brand names that made up one stimulus. All subjects did this for all 56 stimuli, irrespective the nature of the experiment. In addition, we asked subjects to what extent they were motivated to see / read the stimuli in the first part of the experiment (which we denoted as the exploratory search condition) and the second part of the experiment (which we denoted as the goal-directed visual search condition).

1. There was no reason to believe that subjects were not familiar with the brand names. Over all conditions and subjects 91.3% of the 224 brand names were reported as familiar and 8.7% were not. Based on these figures it is concluded that the subjects were highly familiar with the a priori chosen brand names.

2. The correlation between the predefined target (as set by the experimenter) and the most conspicuous brand name chosen by the subjects was calculated for each condition. Note we averaged over stimulus exposure conditions. The correlation between the inconspicuous pre-defined brand names and the conspicuous brand names chosen by subjects was not significant (r=-.006). The correlation between the predefined cognitively conspicuous brand names and the ones chosen by subjects was significant (r=.759). It is concluded that the manipulation of conspicuity worked as intended. The white background for the target as opposed to the gray background for the contextual brand names was not in need of a manipulation check. It is assumed that the target brand names were appropriately visually manipulated.

3. On a 7-point scale with end-points 'not at all' (=1) and 'very much' (=7) and no semantic labels in between, the mean score was 2.65 regarding the motivation to see / read the stimuli during the first part of the experiment versus 5.96 for the second part of the experiment. These scores differed significantly from one another ($t_{(1, 249)} = -25.076$; $p = 0.008$). This result is taken as the indication that the visual search manipulation worked as intended.

Analyses

What needs to be compared and why? Two kinds of analyses will be performed (1) within conspicuity condition analyses and (2) between conspicuity condition analyses. The first type of analyses is directed at the examination of the hypotheses for each individual experiment that is

for a particular brand name conspicuity condition, a particular exposure duration condition, and for a particular visual search condition. The general question to solve in this type of analyses is whether the predefined target (conspicuous brand name) is differently recognized as compared to the contextual brand names. The second type of analyses examines the interaction of conspicuity and stimulus exposure durations on recognition accuracy for each visual search strategies. The relevant question is to what extent brand name effectiveness depends on the duration of exposure. The question regarding visual search is under what search strategy are conspicuous brand names effective? The SMIR task allows us to examine interactions between exposure duration and visual search for each conspicuity condition. Note that with 4 conspicuity conditions, (1) inconspicuous brands, (2) visually conspicuous brands, (3) cognitively conspicuous brands, and (4) both visually+cognitively conspicuous brands, and with 3 stimulus exposure conditions (1) 0.5 seconds, (2) 1 second, and (3) 2 seconds, twelve experimental cells result. Table 9 summarizes. The inconspicuous brand names condition serves as a control condition (exposure duration is chosen to be 1 second) [10]. Hence, data for two cells have not been collected. In sum, the independent variables in this study are brand name conspicuity and stimulus exposure duration (both between subjects) and visual search strategy (within subjects). The dependent variable is recognition accuracy.

No a priori or post hoc criteria were made that might have excluded data. Hence, data from all subjects were used for data analyses. For each condition of exposure duration and visual search the recognition accuracy scores were averaged over subjects for each brand name conspicuity condition. A Chi-square test was used for the proportional differences in recognition accuracy between target and contextual brand names. A repeated measures design was used for the second type of analyses with visual search strategy as the within subject variable and stimulus exposure duration and brand name conspicuity as the between subject factors. For reasons of clarity the empirical results are presented in tables (like Table 9) and figures.

Table 9 depicts the experimental design. In total we had four different conditions of brand name conspicuity (rows) and three different stimulus exposure durations (SED) (columns). The layout of the design is followed throughout tables 10, 11, and 12.

TABLE 9: The type of target conspicuity within the 10 experimental conditions

SED=0.5 seconds	SED=1 second	SED=2 second
-	Inconspicuous (VoCo)	-
Visually (V+Co)	Visually (V+Co)	Visually (V+Co)
Cognitively (VoC+)	Cognitively (VoC+)	Cognitively (VoC+)
Visually+Cognitively (V+C+)	Visually+Cognitively (V+C+)	Visually+Cognitively (V+C+)

Table 10 depicts the total numbers of brand names that were correctly recognized for each of four brand name conspicuity conditions and stimulus exposure duration as well as for the two different search strategies.

10 Note that at first we started out to run the experiment just for the one-second-exposure duration. It became clear that the inconspicuous targets were not differently recognized as compared to the contextual brand name. Hence, we left the control conspicuity condition out for the other levels of stimulus exposure duration.

TABLE 10: Total numbers brand names correctly recognized

SED=0.5 seconds				SED=1 second				SED=2 second			
Exploratory		Goal-directed		Exploratory		Goal-directed		Exploratory		Goal-directed	
Target	Context	Target	Context	Target	Context	Target	Context	Target	Context	Target	Context
-	-	-	-	250	779	471	1382	-	-	-	-
427	1030	643	1568	346	968	516	1462	471	1271	655	1964
238	753	293	955	298	1016	467	1423	332	1159	599	1761
335	572	435	622	242	557	375	1152	361	800	583	1632

Total number target brand names was 25 (subjects) x 56 (trials) x 1 (target brand names per stimulus) = 1400; Total number contextual brand names is 25 (subjects) x 56 (trials) x 3 (flanking brand names per stimulus) = 4200.

Table 11 depicts the same results in recognition accuracy converted to percentages.

TABLE 11: Percentages (%) brand names were correctly recognized

SED=0.5 seconds				SED=1 second				SED=2 second			
Exploratory		Goal-directed		Exploratory		Goal-directed		Exploratory		Goal-directed	
Target	Context	Target	Context	Target	Context	Target	Context	Target	Context	Target	Context
-	-	-	-	17.9	18.5	33.6	32.9	-	-	-	-
30.5	24.5	45.9	37.3	24.7	23.0	36.9	34.8	33.6	30.3	46.8	46.8
17	17.9	20.9	22.7	21.3	24.2	33.4	33.9	23.7	27.6	42.8	41.9
23.9	13.6	31.3	14.8	17.3	13.3	26.8	27.4	25.8	19.0	41.6	38.9

Table 12 provides the calculated χ^2. The general hypothesis tested was if the targets were significantly different recognized as compared with the contextual brand names. The a & b's indicate the significantly differences, where a denotes that the target is recognized over the contextual brand names and b denotes that the contextual brand names are recognized over the target brand names. Figure 12 depicts the results visually.

TABLE 12: Recognition accuracy differences between target and contextual brand names (χ^2 are depicted)

SED=0.5 seconds		SED=1 second		SED=2 second	
Exploratory	Goal-directed	Exploratory	Goal-directed	Exploratory	Goal-directed
-	-	0.333	0.258	-	-
19.482 a	32.465 a	1.624	1.927	5.601 a	2.391
0.621	1.985	4.933 b	0.172	8.095 b	0.316
82.221 a	181.339 a	13.898 a	0.218	29.008 a	3.408

χ^2cv = 3.841, œ=.05, a= significant target > context, b= significant target < context, χ^2 = (Total targets + Total contextuals) x (Yes responses target x No responses context - No responses target x yes responses context) ^{2} / [(yes responses target + no responses target)(yes responses context + no responses context)(yes responses target + yes responses context)(no responses target + no responses context)]

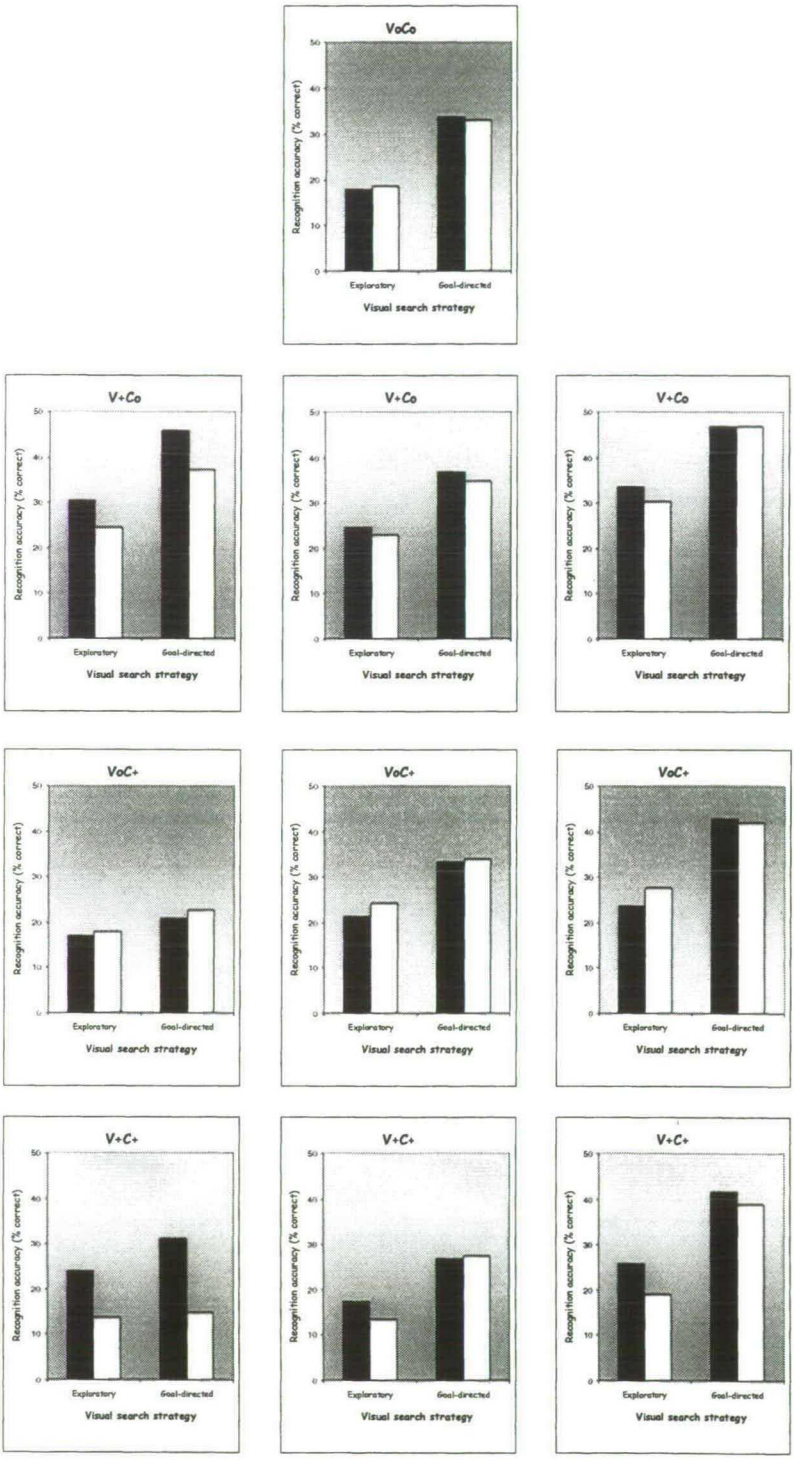


Figure 12: Recognition memory for the conspicuous brand names and the contextual brand names for the two visual search strategies and three different stimulus exposure durations

The repeated measures [11] analyses with visual search strategy as the within subject factor with two levels (exploratory search and goal-directed search) and the two between subject factors each with three levels (stimulus exposure duration with levels 0.5, 1, and 2 seconds and brand name conspicuity with levels visually, cognitively, and visually+cognitively conspicuous brand names) eventuated in the following results for the conspicuous targets.

The test of the within subject effects showed a main effect of visual search strategy [$F(1, 12599) = 693.970$; $p=0.000$]. More target brand names were recognized correctly under the goal-directed visual search as compared to the exploratory visual search routine. The interaction with type of conspicuity was significant [$F(2,12598) = 3.135$; $p=0.044$] and the interaction with stimulus exposure duration was significant as well [$F(2,12598) = 21.410$; $p=0.000$]. Also, the three-way interaction with type of conspicuity and stimulus exposure duration was found significant [$F(4,12596) = 10.758$; $p=0.000$].

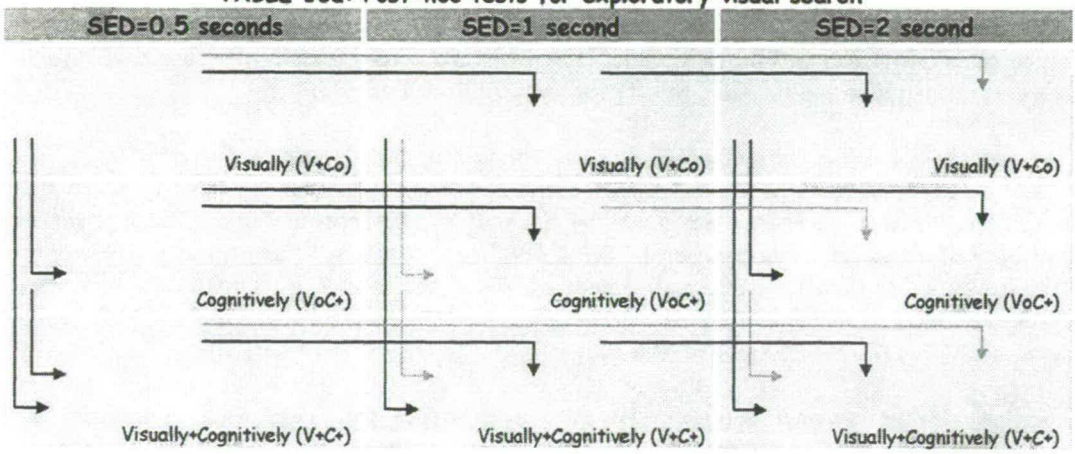
The test of the between subjects showed a main effect for brand name conspicuity on recognition memory [$F(2,12598) = 89.172$; $p=0.000$] and a main effect for stimulus exposure duration on recognition memory [$F(2,12598) = 71.493$; $p=0.000$]. The interaction between stimulus exposure duration and type of brand name conspicuity on recognition memory was significant as well [$F(4,12596) = 20.699$; $p=0.000$]

Note that no specific hypotheses on the effects of exposure duration on recognition memory were formulated because of the exploratory character of this study. On the other hand, as shown, a significant interaction between type of conspicuity and stimulus exposure duration should not be excluded. Scheffé's multiple comparison t tests [12] were used for the post-hoc test and revealed that recognition accuracy is different between condition levels. Table 13a visualizes the results for the exploratory visual search condition and Table 13b for the goal-directed visual search condition.

11 The measurement of recognition accuracy, i.e. the dependent variable, has either of two values. Therefore, the nature of the data is ordinal (e.g., recognized = 1; not recognized = 0). If we sum all responses we generate metric data. This gives us the opportunity to go beyond descriptive statistics. If we do this for each subject separately then is it allowed to use a parametric statistical test like an ANOVA - repeated measures.

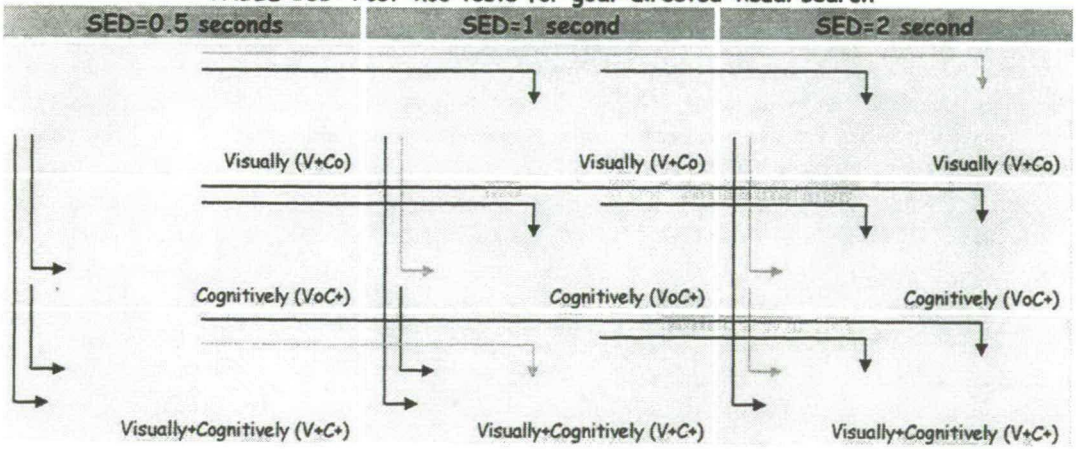
12 Scheffé's multiple comparison t tests are available by author on request.

TABLE 13a: Post-hoc tests for exploratory visual search



The black lines indicate that the differences between those levels were significantly different whereas the gray indicates that the difference in recognition memory was not significant.

TABLE 13b: Post-hoc tests for goal-directed visual search



The black lines indicate that the differences between those levels were significantly different whereas the gray indicates that the difference in recognition memory was not significant.

Discussion and conclusion

The purpose of the present study was to investigate the effectiveness of conspicuous brand names. It was predicted by the ASM that brand names, which are conspicuous vis-à-vis the contextual brand names at the where-level, what-level, or both would differ in the selection-for-memory probabilities when consumers adopt an exploratory search strategy (hypotheses 1, 2, 3, and 4). This was empirically supported. In fact, visually conspicuous brand names increase the probability to be selected-for-memory (for all exposures) [13], while cognitively conspicuous brand names decrease the probability to be selected (for 1 and 2 seconds exposure durations but not for 0.5 seconds). Visually+cognitively conspicuous brand names, which are conspicuous at both the where-level and what-level, increase the probability to be selected for all exposure durations. It was also predicted by the ASM that recognition accuracy for the conspicuous brand names would not be different from recognition accuracy for the contextual brand names under the goal-directed visual search condition (hypothesis 5). This was empirically supported as well. Contrary to our predictions the recognition accuracy were found to be different for the 0.5 second stimulus exposure duration in the case of visually, and visually+cognitively conspicuous brand names. Not surprisingly, recognition accuracy is enhanced by increased stimulus exposure duration, and for intentional acts (goal-directed visual search). Here we point to the risk of a sequence effect that was raised earlier in the method section. We argued that any conspicuity effects found for the exploratory visual search condition are captured and equally extended in the recognition scores for the goal-directed visual search condition. Although it is realized that, in principle, the experimental design may not be legitimized on the basis of results obtained with that same design, we may observe that the data does not support that a sequence effect occurred.

The main conclusion is that the obtained results support the predictions by the attention-selection-model. Not expected was that the cognitively conspicuous brand names had lower selection-for-memory probabilities. On the other hand, the unexpected results were consistently found and therefore call for an explanation that should make it possible to adapt on the ASM in order to account for these findings. Later on, we will speculate about a possible solution. First we elaborate on the results some more.

Exploratory visual search

Stimulus exposure duration: Half-second

The finding that visually conspicuous brand names and visually+cognitively conspicuous brand names have a higher recognition accuracy as compared to the contextual brand names was predicted. Not predicted was that cognitively conspicuous brand names have equal selection probabilities as compared with the contextual brand names. Important is, that visually conspicuous brand names have higher recognition accuracy as compared with the cognitively conspicuous brand names and the visually+cognitively conspicuous brand names.

At first sight, these findings suggest that at a stimulus exposure duration of 0.5 second

13 Note that the effect was not found for the one-second exposure duration. If we drop just a few subjects from the analyses the effect becomes significant, however. The few subjects that were deleted in this second analysis performed terrible on both search conditions. Therefore, the fact that the interpretation is biased for the one- second exposure duration is in line with the other findings at the half-second and two-second duration.

conspicuous identity information cannot become available for responding. On the other hand, a careful inspection of the data shows that conspicuous identity information has an impact on recognition accuracy if the information is also visually conspicuous. In fact, visually+cognitively conspicuous brand names have lower recognition accuracy as compared to visually conspicuous brand names but higher recognition accuracy as compared to cognitively conspicuous brand names. Because the only difference between these conditions is the pre-defined target (the contextual brand names are equal for all conditions), the effect is attributed to the type of brand name conspicuity.

Stimulus exposure duration: One-second

The finding was predicted that visually conspicuous brand names and visually+cognitively conspicuous brand names have higher recognition accuracy as compared to the contextual brand names. The important finding is that cognitively conspicuous brand names have lower selection probabilities than the contextual brand names. Visually conspicuous brand names have equal recognition accuracy as compared with the cognitively conspicuous brand names and higher recognition accuracy as compared with the visually+cognitively conspicuous brand names. As compared to the results for the 0.5 seconds exposure duration the first result to note is that cognitively conspicuous brand names have lower selection probabilities and not equal selection probabilities.

Stimulus exposure duration: Two-seconds

The finding that visually conspicuous brand names and visually+cognitively conspicuous brand names have higher recognition accuracy as compared to the contextual brand names was predicted. The important finding is that cognitively conspicuous brand names have lower selection probabilities than the contextual brand names. Visually conspicuous brand names have higher recognition accuracy than the cognitively conspicuous brand names and the visually+cognitively conspicuous brand names.
As compared to the results for the half-second and one-second exposure duration the first result to note is that cognitively conspicuous brand names have again lower selection probabilities (such as in the one- second exposure) and do not have equal selection probabilities as found in the 0.5 second exposure.

Goal-directed visual search

Stimulus exposure duration: Half-second

We did not predict the finding that visually conspicuous brand names and visually+cognitively conspicuous brand names have higher recognition accuracy as compared to the contextual brand names. Predicted was that cognitively conspicuous brand names have equal selection probabilities as compared with their contextual brand names. Important is, that visually conspicuous brand names have higher recognition accuracy as compared with the cognitively conspicuous brand names and as compared with the visually+cognitively conspicuous brand names. Also, that the visually+cognitively conspicuous brand names have higher recognition accuracy as compared with the cognitively conspicuous brand names.

These findings are exactly similar to the findings for the unintentional visual search task. In this particular case the default value of the visual system accounts for the data. The most plausible explanation is that if stimulus exposure duration is very brief, then the goal-directed visual search strategy that is allowed for by the structure of the ASM is not able to reveals it self.

Stimulus exposure duration: One-second

As predicted, the recognition accuracy between any type of conspicuous brand name and contextual brand names are not different. Any brand name within each stimulus has an equal probability to be selected for memory storage. Subjects knew that they had to perform a recognition memory task but were not given selection criteria where to act upon, i.e., which brand names from the set of simultaneously presented brand names.

Stimulus exposure duration: Two-seconds

Consistent with the one-second findings, also here no differences in recognition accuracy were found for any type of brand name conspicuity as compared with their surrounding contextual brand names.

Towards a solution

How can we account and explain the findings that were not predicted by the ASM. In other words, how can we account for the findings that cognitively conspicuous brand names have equal and lower selection for memory probabilities than their contextual brand names? And, why is it that the contextual brand names are recognized over the cognitively conspicuous brand names? Together, our findings suggest that the feedback loop from the location conspicuity map (LCM) facilitates responding regarding visually conspicuous brand names in a visual scene, and that the feedback loop from the identity conspicuity domain (ICD) does not facilitate responding regarding the cognitively conspicuous brand names in the visual scene. In fact, if we accept inhibition rather than facilitation for the second feedback loop from ICD to IN then we account for the unexpected findings. Apparently, the stimulus exposures 1 and 2 seconds show this empirically. If we are willing to accept that the feedback loop form the Identity Conspicuity Domain to the Input Map inhibits rather than facilitates memory storage, then the ASM accounts for the unpredicted effects found for the cognitively conspicuous brand names. Second, if we are willing to accept that very brief exposure durations prevent a goal-directed strategy to take over the default selections, then all effects are accounted for. The question here is if there is a rationale for the acceptance of these ASM adjustments and extensions.
The winner-takes-all rule at the identity conspicuity domain (ICD) is based on the meaning fit of individual items. It was suggested that a brand name that does not fit, based on the identity relationship between all brand names present in the visual scene, is cued for memory storage (that is, under the exploratory visual search condition). In other words, we expected that memory storage was facilitated by conspicuous brand names. There were two reasons to expect this. First, it was in line with the reasoning that items in a visual scene are completely analyzed in parallel up to the identity level. Second, the facilitation effect for cognitively conspicuous brand names at the ICD is in line with the facilitation effect suggested for the visually conspicuous brand names at the location conspicuity map. In contrast with a facilitation effect an inhibition

effect was observed for cognitively conspicuous brand names. This leads to the suggestion that brand names that do not fit with the surroundings at the identity level are inhibited and therefore have a lower probability to be selected for memory. Parallel distributed processing (PDP) models or connectionist networks to memory may provide the solution to understand and explain this finding. Though several PDP models have been proposed (see McLelland and Rumelheart, 1986a,b) the assumptions common to these models is of interest here. In essence, PDP models assume that the information about a person, object, or event is stored in several inter-connected units rather than in a single place. In our brand names example, it is assumed that brand names are stored in separate units and that, over time, learning and experience increase the connection strengths among these units. When one of these units is activated, it is assumed that other connected units are activated as well. If we assume that in our study four brand names are simultaneously activated, then three contextual brand names are related, meaning that the connection strengths between these brand names may enhance itself circularly, i.e., each brand activates the other two. At the same time the strength of the connection between the contextual brand name units and the cognitively conspicuous brand name unit is assumed to be weak. If this cognitively conspicuous brand name is simultaneously present, the memory network, based on over time learning and experience, probably inhibits the activation of the connection strength between the units of the contextual brand names and the cognitively conspicuous brand name. As a result, the cognitively conspicuous brand name is inhibited and has a lower selection-for-memory probability. This process - the spreading of activations - takes place within a time-domain. This is consistent with our findings because the inhibition effect is not observed for the 0.5 seconds exposure duration but only for the 1 and 2 seconds exposure durations. Further, the data showed that visually+cognitively conspicuous items have lower memory accuracy than visually conspicuous items. It was shown as well that the difference in recognition accuracy between visually+cognitively conspicuous targets and contextual brand names is larger than the difference between visually conspicuous targets and the contextual brand names. The visually+cognitively conspicuous brand names do stimulate a memory effect but the effect is limited because the related contextual items enhance themselves circularly, and thereby inhibiting the activation strengths between the units of these contextual brand names and the conspicuous brand name. In addition, the PDP approach to memory offers a conceptual framework that fits nicely with the unlimited capacity notion. The PDP approach is consistent with the view that processing occurs in parallel rather than in a serial fashion (e.g., Eysenck and Keane, 1990). Note that the PDP appraoch applies only to the Identity Conspicuity Domain (ICD).

Remember that Neumann (1980) suggested that the superiority of physical selection criteria (e.g., the color of the target) is restricted to intentional or goal-directed tasks whereas semantic (or identity) selection criteria (e.g., a letter among digits) may at least be efficient in the case of unintentional or explorative selection. Note that it was beyond the present thesis to study the effect of conspicuity for different selection criteria, i.e. different instructions. Neumann suggestion was based on studies, in which it was found that a subjects' own name had higher selection probabilities on memory retrieval when no specific selection criterion was given regarding their own name (Moray, 1959). In other words, all stimuli information - the subjects' name included - must be processed up to the level where it can be identified. However, the subjects' own name is not relatively cognitively conspicuous (vis-à-vis the contextual items) but is inherently cognitively conspicuous (i.e., is vivid). Because cognitively conspicuous brand names vis-à-vis their contextual brand names are not necessarily vivid it seems that items in a visual scene,

which are cognitively conspicuous vis-à-vis the flanking elements do not facilitate a memory effect if no specific a-priori selection criterion is provided. In the case of intentional selection, physical stimulus attributes are much better selection criteria than semantic attributes. Why this is so is still unsolved, however (Neumann, 1996). A possible answer may be found in the default selections of the ASM. In our findings visually and visually+cognitively conspicuous brand names (at the 0.5 second exposure duration) were found to be effective under both visual search conditions. This suggests that, irrespective of subjects' intention, the default solution provided by the structure of the visual system operates and selects the most conspicuous brand name for memory.

In the larger context of this thesis some very recent literature on emotion is worth seeing. The reason is that it may provide an additional argument, apart from the PDP approach, for understanding the effects of brand name conspicuity found in the empirical part of this thesis. Aside, Damasio (1998) suggested that emotions are the major adaptive factor in the human (consumer) decision-making process. He argues that cognition and emotion are not 'oppositional' and that affective meaning might even drive cognitive activity. Two papers that discuss the aesthetic response to art are reviewed here. This topic - the aesthetic responses to art - has been very recently discussed in a special issue of the Journal of Consciousness Studies, entitled 'Art and the Brain' (1999). The contributions in this volume came from various authors with different backgrounds viz. psychology, neurophysiology, anthropology, evolutionary biology, philosophy and art. Two contributions are interesting here. One is by Ellis (1999) because of its theoretical idea regarding input-output related processes, which is consistent with the line of reasoning presented in this thesis. The other contribution by Ramachandran and Hirstein (1999) offers "eight laws of artistic experience". In particular, two laws are important viz. (1) the perceptual grouping or binding rule, and (2) the extraction of contrast rule. Both these rules may provide an additional insight in the conspicuity effects found.

Ellis' article entitled 'The dance form of the eyes: what cognitive science can learn from art' will be reviewed first. We restrict ourselves here to one section of the paper that focuses on the suggestion that *"total motivational purposes of our organisms lead us to see according to expectations and motivated interest that precede the presentation of a given stimulus"* (Ellis, 1999, p. 162). Interestingly, Ellis opts for a view that "reverses a traditional way of looking at the brain, in which perception was supposed to feed information into the brain, which in turn led to thoughts about the information and finally action" (p. 162). In fact, he argues that the response must *precede* the stimulus. "Many neurophysiologists (e.g., Damasio, 1994; Posner, 1990; Luria, 1980; Panksepp, 1998; Pribram, 1991) are now beginning to realize that the artists were right all along, and that the situation is just the reverse: our emotions gear us up for action, and *then* we search and scan the environment for relevant perceptual cues, which become conscious to the extent that they resonate with image schemas (Varela et al., 1991) that were already in the process of being developed in response to frontal limbic emotional purposes (Ellis, 1995) (...) Being geared up for action does not determine *which* action we want to perform. It only alerts us that something important is happening, and that we need to do something about it." (Ellis, 1999, p. 162/3). The next citation by Ellis clearly demonstrates the action related approach as has been put forward in this thesis in the context of selective attention.

> "Thus the model of the mind as a passive receiver of causal work done by stimulus inputs places the cart before the horse. It is this fundamental shift in the direction of causation which is now sometimes referred to as the 'enactive' view of the mind (...) rather than a stimulus *causing* a response, it is the response which must occur *first*, and then *act* on the incoming afferent signals to *produce* a stimulus. We might call this enactive approach the current 'Copernican revolution' in cognitive theory and neuroscience." (Ellis, 1999, p.167)

The following quote is interesting from several perspectives. First, it is recognized that not only the individual is in control (voluntary or intentional acts) but the stimulus environment as well. Second, it deals with conspicuous objects in a visual scene and selective attention. Third and most importantly from a methodological point of view, Ellis argues that if no specific selection criteria are provided of where to act upon (like in our experiments), then subjects simply make up their own goal.

> "In some instances, the emotional motivations not only pre-exists the presentation of the stimulus, but are also activated in a primitive, preperceptual way by the stimulus itself, through direct contact with the emotional brain prior to perceptual processing. (...) Similarly in visual perception, we are preprogrammed to treat certain kinds of items as having attentive priority - moving objects, objects whose Gestalt makes them seem novel, unusual or unexpected, and especially objects whose retinal image suddenly *increases* in size. This direction in the philosophy of mind is completely consistent with the notion that most basic categories are purposeful, subject-related ones involving value, meaning, goal, effort etc. These subject-related categories enjoy a certain priority over incoming sensory information. The categories of an organism's consciousness are determined, not just by input from the environment, but also by the purposes of the organism. (...) In light of the above analysis, to say that art 'moves us' is slightly misleading. It might be more accurate to say that it presents us with a favorable opportunity to allow ourselves to move. This would be consistent with the fact that each viewer will get something different out of the same painting, and the same viewer will get different things at different times" (Ellis, 1999, p. 168/9)

The idea that subjects make up their own goal is important. In the goal-directed visual search task subjects 'knew' that later on a recognition task had to be performed. Subjects, like Ellis (1999) suggested, somehow decide where to act upon in their <u>own</u> goal-directed manner (and therefore any brand name may be selected). The assumption is that each subject will get something different out of the same stimulus. Therefore, we expected that a conspicuous brand name had an equal selection-for-memory probality as compared to the inconspicuous brand names. This was found except for the visually and the visually+cognitively conspicuous brand names in the 0.5 stimulus exposure duration. Apperantly, an intentional act is allowed to overrule the default value of the processing system over time.

We now discuss two rules proposed by Ramachandran and Hirstein (1999) that may provide an addiditional argument to account for the conspicuity effects. To account for our findings we proposed that the feedback loop from the ICD to the input map inhibits rather than facilitates the most conspicuous item in a visual scene. The feedback loop from LCM to input map facilitates the most conspicuous brand name in the visual scene. In other words, at the where level the conspicuous brand name is facilitated and increases the probability to be selected for memory, and at the what level the contextual brand names are facilitated for memory effectiveness. The PDP approach may explain these effects but it is yet unclear what kind of rules may guide this

process. Therefore, the two rules suggested by both authors in the context of aesthetic experience are here of interest. These two rules are (1) grouping and (2) contrast.

> Grouping is achieved by "two dozen visual [brain] areas, each of which is concerned with a different visual attribute such as motion, color, depth, form, etc. These areas are probably concerned with extracting correlation's in 'higher dimensional spaces - such as 'color space' or 'motion space'. In a regular topographic map - e.g., in area 17 - features that are close together in physical space are also close together in the brain (which is all that is meant by 'map'). But now think of *non-topographic* maps - say a map of 'color space' - in which points that are close together in *wavelength* are mapped close together in the color area of the brain *even though they may be distant from each other physically* (Barlow, 1986). Such proximity along different feature dimensions may be useful for perceptual grouping and 'binding' of features that are similar within that dimension. (...) even though the grouping may be initially based on autonomous process in each module (Marr, 1981), once a cluster of features becomes perceptually salient as a 'chunk' (...), it may send a signal to the limbic centers which in turn causes you to 'hold on' to that chunk to facilitate further computation. There is physiological evidence that grouping of features leads to synchronization of the spikes (action potentials) of neurons that extract those features (Singer and Gray, 1995; Crick and Koch, 1998) and perhaps it is this synchrony that allows the signal to be sent to the limbic pathways (...). Given the limited attentional resources in the brain and limited neural space for competing representations, at *every* stage in processing there is generated 'Look here, there is a clue to something potentially object-like' signal that produces limbic activation and draws your attention to that region (or feature), thereby facilitating the processing of those regions or features at earlier stages. Furthermore, partial 'solutions' or conjectures to perceptual problems are fed back from every level in the hierarchy to every earlier module to impose a small bias in processing and the final percept emerges from such progressive 'bootstrapping' (Ramachandran et al., 1998)" (Ramachandran and Hirstein, 1999, p. 22/3).

> "Grouping (...) is an important principle, but the extraction of features prior to grouping - which involves discarding redundant information and extracting *contrast* - is also 'reinforcing'. Cells in the retina, lateral geniculate body (a relay station in the brain) and in the visual cortex respond mainly to edges (step changes in luminance) but not to homogeneous surface colors [see also Hubel and Wiesel, 1979] (...) What is frequently overlooked though is that such contrast extractions - as with grouping - may be intrinsically pleasing to the eye (...). Again, though, if contrast is extracted autonomously by cells in the very earliest stages of processing, why should the process be rewarding in itself? We suggest that the answer once again has to do with the allocation of *attention*. Information (...) exists mainly in regions of change - e.g., edges -and it makes sense that such regions would, therefore, be more attention grabbing - more 'interesting'- than homogeneous areas. So it may not be coincidental that what the cells find interesting is also what the organism as a whole finds interesting (...). We do know that the attention grabbing effect of contrast must be very important principle in nature, since it is often used as camouflage device by both predators and their prey" (Ramachandran and Hirstein, 1999, p. 26/7).

For now we leave out the authors' notion of attention. Only the two rules, i.e., contrast and grouping are of interest. Despite the orthagonal relation between the two rules, the authors provide an interesting marriage of the two rules.

> "At first the two principles we have just considered seem antithetical; grouping on the basis of similarity is rewarding, but if so how can contrast (the very opposite of grouping) also be rewarding? One clue comes from the fact that the two mechanisms have different spatial constraints; grouping can occur between similar features (e.g. color or motion) even if they are far apart in space. Contrast, on the other hand, usually occurs between dissimilar features that are physically close together. Thus even though the two processes seem to be inconsistent, they actually complement one another in that they are both concerned with the discovery of objects - which is the main goal of vision. (...) It is easy to see then why the two should be mutually reinforcing and rewarding to the organism." (Ramachandran and Hirstein, 1999, p. 27).

Building upon Ramachnandran and Hirstein (1999) in the context of the distinction between the where and the what level, it is proposed here that grouping operates at the what level and that contrast operates at the where level. In other words, though it is logically plausible that both rules may operate at both levels, the simple solution, to the orthogonal relationship between the rules, is that the rules operate simultaneously but at different levels. To put it yet differently, grouping is not based on the location of items in a visual scene but on the semantic or identity relations between items, i.e., the contents or what the items are all about. Grouping on the basis if item-category relations account for the facilitation effect for the contextual brand names in the case a cognitively conspicuous brand name is present. Contrast is based on the location of items in a visual scene, i.e., on the spatial position or where the items are positioned. Contrast on the basis of item-visual-dissimilarity accounts for the facilitation effect for the visually conspicuous brand names.

In sum, the attention-selection-model (ASM) was tested using the serial multi item recognition (SMIR) task. It was expected that conspicuous brand names vis-à-vis their contextual brand names had different recognition memory accuracy when subjects adopt an exploratory visual search strategy and that if a goal-directed visual search strategy is adopted, the brand name conspicuity effect on the probability for selection-for-memory vanishes. It was found that visually conspicuous brand names result in higher recognition accuracy, cognitively conspicuous result in lower recognition accuracy, and visually+cognitively conspicuous brand names result in higher recognition accuracy, that is for the exploratory search condition. The recognition memory effects were not found for the goal-directed search condition except for the very brief stimulus exposure durations. These results support the ASM model. That is, we assume that (a) the feedback loop from ICD to input map inhibits rather than facilitates the conspicuous brand names, and (b) that for very brief exposure durations the allowed visual search strategy (goal-directed search) is not able to overrule the default selection-for-memory probabilities of the processing system. We argued that the parallel distributed processing (PDP) framework to memory in conjunction with the grouping rule and contrast rule account for and explain the observed effects.

In conclusion, the ASM was proposed as a single model of attention. It was argued that a single model is better than a number of classic theories of attention that all can be criticized on inconsistencies. The ASM can be falsified on empirical grounds and the SMIR task has the advantage that it can be generalized to real environments. It can be transferred to a number of different areas of application (e.g., Art). We now turn the implications for consumer research.

Chapter 5: IMPLICATIONS FOR CONSUMER RESEARCH

In consumer research, attention plays a crucial role in information processing models and is associated with attention capture (selection) and retention (the allocation of resources or processing capacity). The concept of attention is hardly discussed but simply conceptualized in terms of a prerequisite for processing in communication information processing models. As a consequence, most research effort was devoted to examine higher order cognitive processes and affective processes', assuming that selective attention was not the interesting issue (Pieters and Warlop, forthcoming). In particular, the localization and identification of stimuli present in the consumer environment has, to my knowledge, never been an explicit topic for research. In the attention-selection-model (ASM), localization and identification are separated and assigned to two distinct, parallel information processing channels (where and what) that have their own properties and characteristics. This ASM is at variance with current theoretical ideas in consumer research. That is, regarding the important aspects of (limited versus unlimited) capacity and selection reasons (selection-for-processing versus selection-for-action and selection-for-memory). It is believed, however, that the ASM provides the possibility to revisit and reformulate interesting and long-standing research issues in consumer research and therefore may stipulate the research agenda in an unexplored direction. These issues relate to, for example, (1) information (over)load, (2) the information processing of visuals and text in ads, (3) perceptual salience in stimulus-based shopping situations, (4) stimulus salience in association with MOA information processing models, (5) brand consideration set inclusions during brief exposures, (6) consumer information search. In consumer research these issues have been associated with the concept of attention. If we assume, for the sake of argument at least, that the ASM is basically correct it must follow that contemporary conceptualization(s) of attention in consumer research is(are) not sufficient to explain the observed data. Unfortunately, and probably unintentionally, conceptualizations of attention in consumer research are sometimes very unclear and modified along the way to explain the observed facts. Hence, every now and then it seems a small step from the razzle-dazzle conceptualizations of attention to the twisting of words to account and explain the findings.

The breakdown of this chapter is as follows. The first section examines the current conceptualizations of attention in consumer research. We do this by drawing from the consumer research literature, which shows that consumer research transferred the three classic theories of attention viz. Filter theory, Capacity theory, and Resource theory from the visual and auditory perception area to the field of consumer research. Some razzle-dazzles will become evident along the way as well as two dissident views. The second section deals with some open research issues in consumer research. The ASM might have important implications for both sections. The ASM is proposed as a single theory of attention and might stipulate the future research agenda in a different direction.

THE CONCEPTUALIZATION OF ATTENTION IN CONSUMER RESEARCH

Consumer research has recognized the importance of theories of attention from psychology.

> "Psychological theory of attention (...) has been developed to analyze the reception of auditory and visual stimuli in noisy environments. Because advertising, too, consists of messages received in a complex or noisy environment, its analyses should be able to make use of the extensive development of attention theory in psychology". (Greenwald and

Leavitt, 1984, p. 583, footnote)

The view that consumers are limited information processors because they have a limited capacity to process information is widely accepted in consumer research. Moreover, the acceptance of this point of view has been the starting point of theorizing about attentional processes.

> "(...) consumers have limited capacities to process information" (Bettman, Johnson and Payne, 1991, p. 57)

> "The notion that the human processing system has an asymptotic limit in "capacity" can be used as the basis for the investigation of such related constructs and processes as "attention", "elaboration", and "mental effort" (Owen, Lord, and Cooper, 1995, p. 84).

> "Given the widely accepted model of a capacity-constrained information processor (cf. Bettman, 1979), *attention* serves as an important "tuning" mechanism in the active selection of information for additional processing (Bargh, 1982; Broadbent, 1977; Kahneman, 1973; Neisser, 1976)". (Ratneshwar, Mick, and Reitinger, 1990, p.547)

If it comes to the capacity issue of the brain, then there are two possibilities we might consider on pure logical grounds. One is the brain is limited in capacity to process information. The other is that there are no capacity limitations to process information. It is clear that in consumer research the limited capacity to process view is advocated. In contrast, the ASM is based on the unlimited capacity to process view.

The issue of selection during perceptual analyses is widely accepted in consumer research. The presumed reason for selection, conceptualized as the functional consequence of limited capacity, as the following two quotes show, is found in consumer literature as well.

> "Before and during conceptual analyses, consumers engage in *perceptual* analyses (Greenwald and Leavitt, 1984) when devoting focal attention to the stimulus. In perceptual analyses, consumers examine sensory features, such as shape, color, and size, they decipher the stimulus into category codes, such as brand name, pictorial and textual information for a brand package, and they select certain elements of the stimulus over others". (Pieters and Warlop, 1999, p. 2, underlined added)

> "In view of this capacity limitation, one must selectively isolate, from the enormous set of stimuli present in the environment, those few which are to become the subject of STM operations. This selection process may be voluntary (volitional, purposeful) or involuntary (imposed by some element of surprise or contrast with competing stimuli)". (Lord and Burnkrant, 1993, p. 48)

Though the ASM has made the argument to disagree this position on both these issues, it is the common view in consumer research. The selective attention issue can be found in consumer research more thoroughly and clearly in the following citations. Here the three classic attention theory viz. Filter theory, Capacity theory and Resource theory become evident.

Ratneshwar et al. (1997) posit their view regarding selection, which is in close resemblance with the theoretical ideas of Broadbent. Filter theory states that to overcome information overload, a filter at the entrance of the processing system selects the relevant from the irrelevant

information.

> "(...) we posit, that whenever there is potential for information overload, consumers will selectively attend to those product features (...) that map on to habitual and/or situational benefits that are currently salient. (...) Features that map on salient benefits should pass through the attentional filter of the consumer, while features that do not map on these benefits will be 'filtered out'" (Ratneshwar, Warlop, Mick, and Seeger, 1997, p. 245)

Also Krugman (1977) points to Broadbent's filter theory as a starting point to deal with selective attention to advertising.

> "I recently received a long-awaited copy of a paper by the eminent Donald Broadbent of the Department of Experimental Psychology at Oxford University (Broadbent, 1977). In this paper Broadbent cites research to support the view that the perceptual system operates in a hierarchical fashion - i.e., the eye (or mind) in selecting from the environment what it will attend to must reject a great deal in order to select in what it will accept. This process of rejection is an active rather than a passive process, says Broadbent. Thus, to some small but measurable degree, one must note, perceive, or identify what one will not attend to in order to reject it (...) One of the main unresolved tasks for advertising research is to explore the unknown territory between what we now call attention and nonattention. The selective process of attention involves more levels of attention than we like to admit (...) In general, let's not shortchange the remarkably sensitive capacities of the human eye and brain, and let's not shortchange the advertiser". (Krugman, 1977, p. 12)

Kahneman's capacity theory is found in the work by Pieters et al. (1996), Pieters and Warlop (1999), and Schoormans and Robben (1997).

> "Visual attention is generally conceptualized as (...) "a brain operation producing a localized priority in information processing - an attentional 'window' or 'spotlight' that locally improves the speed and reduces the threshold for processing events" (Deubel and Schneider, 1993, p. 575)" (Pieters, Rosbergen and Hartog, 1996, p. 242)

> "Attention refers to the momentary focusing of information processing capacity on a particular stimulus (...) The ability of stimuli to attract consumer attention is a prerequisite for information processing" (Schoormans and Robben, 1997, p. 274)

Broadbent's filter theory, which in fact is a structural single channel information theory, goes sometimes hand in hand with Kahneman's capacity theory of attention. Note the reference made to Broadbent and Kahneman in association with capacity theories of attention. Of course, Broadbent's filter theory is not a capacity theory.

> "Capacity theories of attention (see, e.g., Broadbent, 1971; Kahneman, 1973) as well as information-processing models (see, e.g., Greenwald and Leavitt, 1984; MacInnis and Jaworski, 1989) assume that the attention allocated to an ad is a function of consumers' motivation, opportunity, and ability, which are affected by, for instance, physical properties of the advertisement and consumers' characteristics" (Rosbergen, Pieters, and Wedel, 1997, p. 305)

The transitions from Kahneman's capacity theory to variants of the resource theory are best illustrated by the following citations.

> "(...) Though in models of attention both focus (our term 'attention') and the extent of processing (our term 'capacity') are considered under the general rubric of attention (see Kahneman, 1973; Norman and Bobrow, 1975) we *separate the two constructs* here. In our view attention more clearly details that which receives processing resources. This construct may or may not predict the extent of working memory (capacity) allocated to the task. As is consistent with other integrative attitude formation models (Batra and Ray, 1985; Greenwald and Leavitt, 1984; Mitchell, 1981; Petty and Cacioppo, 1986a, b), we propose that allocated processing capacity is a limited resource that is partitioned in varying degree as a function of motivation" (see MacInnis and Jaworski, 1989, p. 5, italics added).

This citation exemplifies, how in consumer research attentional theories may be modified, in particular, the phrase "we separate the two constructs here". Let us first look more closely how Kahneman (1973) handled those concepts since a listed reference to his work suggests that his ideas were widely borrowed. Besides, note the combination of Capacity and Resource theory in the references by MacInnis and Jaworski (1989).

> "It is not easy to find out how Kahneman (1973) defined the relationship between the concepts of attention, capacity and effort (...) (he) gives the impression that he regarded the three terms as synonyms. On the other hand, the title Attention and Effort suggests that he thought of attention and effort as two different concepts. Indeed, a careful reading of the text reveals that he used the two terms with different meanings. However, he did not define their difference consistently, nor did he use the term 'capacity' consistently. One conceptualization of the relationship between attention and effort was based on the distinction between the selective and the intensive aspect of attention, which Kahneman (1973) adopted from Berlyne (1969). The selective aspect refers to the fact that attention can be directed to some contents at the expense of others, while the intensive aspect refers to the fact that a person can deploy more or less attention. Based on this distinction, Kahneman stated that 'the intensive aspect of attention corresponds to effort' (Kahneman, 1973, p.12). This suggests that Kahneman regarded attention as the more general concept, and effort as a term that designed the intensive, but not the selective, aspect of attention. Other formulations imply, however, that effort was meant to be the basis of selective attention as well as of the intensive aspect of attention: '(...) selective attention is viewed as the selective allocation of effort to some mental activity in preference of others' (Kahneman, 1973, p.12). This seems to express a different conceptualization of the relationship between attention and effort, viz. that 'effort' refers to the supply that is allocated, while 'attention' is the act of allocating it. This interpretation is, however, refuted by other passages in the book where Kahneman refers to an 'input of attention' (e.g. pp.9 and 12). It is likewise not quite clear how Kahneman conceptualized the relationship between the concepts of 'attention' and 'capacity'. Sometimes he seems to have used the two terms as synonyms (e.g. pp. 9 and 13). Other passages (e.g. 'a capacity theory of attention', p.7) suggest that he regarded capacity as a theoretical construct that was intended to explain attention." (Neumann, 1996, pp. 401-402).

Neumann's analyses point to the inconsistencies regarding the concept of attention, capacity and effort in Kahneman's theory. It is therefore not surprising that borrowing concepts ('attention' and 'capacity', 'effort') from Kahneman has led to similar inconsistencies and confusions (razzle-dazzles) in advertising communication models. These inconsistencies are best illustrated by the following citations, in which resources, effort and capacity are used changeably (the relevant passages are underlined).

> "The motivation, opportunity and ability to process information play a fundamental role in determining recipient response to promotional communications. As defined by MacInnis et al. (1991:34), motivation is the 'desire or readiness to process', opportunity is 'the extent to which distractions or limited exposure time affect (...) attention', and ability refers to recipients' 'skills or proficiencies in interpreting (...) information'. The Elaboration Likelihood Model (Petty and Cacioppo, 1981) postulates that individuals who are high in processing motivation, opportunity, and ability will, upon exposure to a persuasive message, engage in the purposeful rational processing of message arguments (central route to persuasion). The recipient in such scenario, enjoying the benefit of relatively undistracted exposure to a message which s/he has both the desire and the requisite skill to interpret, is viewed as intentionally allocating cognitive resources for that purpose. Alternatively, at reduced levels of motivation, opportunity or ability, any persuasive effect, which emerges, is presumably associated with the individual's liking or disliking of relatively effortlessly processed executional elements (peripheral cues) of the message (peripheral route to persuasion). Therefore, those following the central route will, according to Petty and Cacioppo, allocate greater effort to the processes of attention, comprehension, elaboration and integration (incorporation of message elements into existing schemata; e.g., personalizing the information to the self) than those responding only to peripheral cues" (Lord and Putrevu, 1993, p. 62)

> "(...) Greater allocation of attentional capacity (...)" (Lord and Putrevu, 1993, p. 69)

The variants of resource theory as suggested by (1) Norman and Bobrow (1975) and Navon and Gopher (1979), and (2) Wickens (1980, 1984) are illustrated by the next citations. First of all, resources are assumed to be limited in capacity.

> "The basic concept is that mental processing capacity should be viewed as a scarce resource" (Bettman, Johnson and Payne, 1991, p. 58)

One of these variants is expressed by the idea that "persuasion is maximized when the resources required for message processing are *matched* by those available: too few resources inhibit message processing and too many prompt idiosyncratic thinking - in both instances reducing the processing of the message and thus its persuasive impact on attitude change" (Tybout, 1995, p.2, italics added). The introduction of antecedent resource conditions in consumer research is viewed as *impressive theoretical progress* (Tybout, 1995).

> "(...) The quantity of resources of a particular composition can influence an affective response to a preattentively processed stimulus (Janiszewski, 1990a) (...) Janiszewski hypothesized that *matching activation*, the increased availability of resources in one hemisphere because of an increased processing load in the opposing hemisphere, was responsible for the effect (...) The matching-activation hypothesis is interesting because it suggests that there may be a way of manipulating the amount of energy consumers devote to an incidental task (...) when there is no goal or objective associated with the processing of information." (Janiszewski, 1993, p. 378)

Janiszewski's conceptualization clearly points to one of the type of pool of resources Wickens (1980, 1984) had proposed, i.e., brain hemispheres.

> "(...) One resource pool is better suited for holistic, inferential processing and is associated with the right hemisphere, while a second resource pool is better suited for

> analytic, sequential processing and is associated with the left hemisphere" (Janiszewski, 1993, p. 377)

Also and because of the interest in resource theory consumer researchers have been involved in dual tasks experiments.

> "Because the secondary information does not receive direct foveal attention, and since attentional resources available for processing the secondary information are limited, it is not surprising that the secondary information cannot be explicitly recognized" (Shapiro, MacInnis, and Heckler, 1997, p. 94)

To my knowledge only Owen (1991, 1992) and Owen, Lord, and Cooper (1995) have seriously discussed these dual tasks in the context of resource constraints. On the one hand, they advocate the dual task paradigm but on the other hand, they point to some warrants regarding the interpretation of the results. Note that Owen et al. refers to the 1984 Navon resources a theoretical soup stone paper. To my knowledge only Owen and colleagues have referred to Navon's paper in the area of consumer research and marketing.

> "Owen (1991) outlines a variety of concerns and cautions regarding the attention-related constructs. The point here is that constructs such as attention, elaboration, involvement, mental effort, and such, all seem to be related to the notion of "capacity", but the full relationship and distinction between such constructs is not yet clear. The RT-probe technique [a measure of response time (latency) to a secondary task is taken as an indicator of mental attention devoted to a primary task] merely detects when capacity is near the threshold of being "swamped", and conclusions regarding any of a variety of capacity-related constructs always require careful scrutiny. Nonetheless, the fact that the secondary task technique does appear to detect *something* should encourage us to use this technique as long as it allows us to make useful inferences regarding an attention-related construct (cf., Navon, 1984; Owen, 1991) (...) Additionally, there is evidence that the human processing system consists of more than just a simple, single "capacity" resource (cf., Owen, 1991). The fact that subjects in high attentional load conditions will respond to a secondary task beep after, say, a one second delay does itself suggest that there exists an auditory resource that can independently attend to and store incoming audio stimuli until a general purpose, main processor can attend to this new input. Nonetheless, the one-second delay can be used as evidence that some sort of general, global attentional resource is being used more heavily. The point is that one must always maintain caution regarding conclusions that can be drawn about the use of processing resources." (Owen, Lord, and Cooper, 1995, p. 86)

Olshavsky (1994) really argues for a completely different view on attention. He claims that "getting attention" cannot be the advertising objective because attention is an epiphenomenon.

> "Within this very general theory of information processing, an importantly different definition of attention is adopted. Specifically, attention is simply that cognitive process or behavior by which information is stored in short-term memory (STM) or working memory: "...So, we will say, more or less synonymously, that information was 'attended to', was 'heeded', or was 'stored in STM'" (Ericsson and Simon, 1980, p.217). The important distinction between Ericsson and Simon's (1980) definition of attention and traditional definitions, whether "sensory" or "cognitive", is that the behavior of storing information in STM is an essential part of every cognitive process that is assumed to underlie the behavior of interest: it is not a separate stage preceding these processes as described in

> McGuire's (1978) and other traditional models of information processing. That is, "attending" or "heeding" is simply a by-product of the structure of central processing unit that is assumed to execute all elementary processes. The elementary information processes that comprise any information processing strategy must look to STM for its input and to place its output for processing by subsequent elementary processes in the overall strategy (program). Hence, attention (as defined here) is a crucial aspect of *all* information processing activities; it is an epiphenomenon, because it is "a phenomenon that occurs with and seems to result from another." (Olshavsky, 1994, p. 99/100).

Owen (1991, 1992), Owen et al. (1995), and Olshavsky (1994) clearly point to some cautions with respect to the interpretation of results and to some differences in conceptualizations on attention. To my knowledge these authors are the only ones that seriously looked at the conceptualization of attention as such.

In sum, at the present time the three theories of attention viz. Filter theory, Capacity theory and Resource theory are the explanatory theories for all kinds of attentional phenomena dealt with in consumer research. In the second chapter some serious theoretical difficulties regarding the attentional theories were illustrated which led to the proposal of the attention-selection-model (ASM).
We now turn to some issues in consumer research that consumer researchers consider important. For each of these issues, the same format is used. First, the issue is introduced as a research problem. Second, the relevant research questions are addressed. Third, some results are described. Fourth, the theoretical explanation is presented. Fifth, some comments are given. Sixth - and this will be an important point - the reasonable assumption is made that the attention-selection-model (ASM) may provide an alternative view or a reinterpretation and an attempt is made to do so. Finally, after the discussion of these issues, some new questions are addressed, which may stipulate the future research agenda. One may interpret this as an attempt to persuade consumer researchers to study the functional relationship between perception and action. The ASM provides the possibility to encounter these issues.

INFORMATION OVERLOAD

The research problem:

The marketing and consumer research discipline is concerned with mistakes or error consumers might make in the purchase of products under conditions of high informational loads. This subject of research is better known as studies on 'information overload'. "Information overload is assumed to have occurred when the prospective buyer is unable to complete the buying task successfully, as might be evidenced, for example, when an objectively inferior product choice is made by a high proportion of consumers under high load conditions" (Owen, 1992, p. 771).

An issue that is yet of more interest regards the quality of information processing of marketing communications under conditions of high information load (Owen, 1992). "People do not always make some "correct" or "incorrect" decision choice when receiving a marketing communication; it is more likely that most marketing communications lead to the remembering of information and to changes in attitudes. Such learned information and attitudes are likely to affect some choice decision at a future time and are additionally, and importantly, likely to affect perceptions of product performance (i.e., satisfaction) after the purchase is made" (Owen, 1992, p. 773).

The effects of information overload on memory, on changes in attitudes, and on the quality of future decisions appears to be an important issue to the discipline of marketing and consumer behavior research.

The relevant question(s):

Is there a point or level at which the information processing system cannot handle more information? Does increasing information load change attitudes and affect future choice decisions?

The proposed theoretical explanation:

It is assumed that the underlying cause of this phenomenon is due to a "limited capacity" processing mechanism and that approaching this limit results in error. In fact, from the perspective of attention theory, multiple processing resources have been proposed to account for the phenomenon of information load. Each resource has its own capacity limitations, implying that information overload may occur at different points, depending on what combinations of resources (e.g., graphical, textual) are engaged for any particular task (Owen, 1992).

Comments:

Owen (1992) refers to Wickens' (1980, 1984) variant of resource theory. In particular, his suggestion about the combination of resources seems most likely to go with Wicken's dimensional model (see also Chapter 2). Neumann (1996), with respect to the dimensional model, concluded that the patterns of empirical results do not lend itself to a simple schema of resources.

A second point refers to the question what is exactly meant by information overload? The theorizing about information overload in consumer research and marketing suggests that consumers are overloaded with a large amount of information (see Bettman, Johnson and Payne, 1991). The argument is that we encounter a few hundred advertising messages per day (Britt, Adams & Miller, 1972). The Britt et al. (1972) paper is frequently cited to connect information load with selective attention. The point here is that the amount of information that is present *over time* in the consumer environment is not of interest per se. On the contrary, if one deals with attention (and with the capacity and selection aspects), then the relevant point is if the consumer has in fact limited capacities to process the informational inputs that reaches the senses *at one time*. The information that does not reach the sense organs is not to be considered relevant at all for the theoretical discussion.

The view according to the ASM:

The ASM advocates the view that there is unlimited capacity to process information but there is limited capacity to perform more tasks simultaneously in the same domain. For that reason the selection-for-action view and the selection-for-memory view were introduced. If consumers do not act in a goal-directed manner, then the default value of the processing system lets visually conspicuous items take precedence (see results, this thesis). Other items in the consumer environment are processed as well (as shown by the difference between visually and visually+cognitively conspicuous brand names) but do not yield in a higher selection-for-memory

probability. In general terms, the data suggest that brand name conspicuity effects depend upon the strategy adopted by the consumer and upon processing time constraints.

A new direction of research:

For a new direction of research it may be interesting to investigate the relation between number of input stimuli on task performance under different task instructions. The number of stimuli can be easily manipulated. Note, however, that the stimuli should be exposed to the consumers simultaneously. One may even choose to examine the effect of conspicuous stimuli items by changing the visual characteristics or semantic meaning vis-à-vis the contextual items. Assuming that we are dealing with a choice task, the different task instructions inform the subject how to act and where to act upon (selection-for-action). Given this setup, what kind of choice errors can be found? Can there be differences in choice error between the specific instruction / required response condition and no specific instruction / the effectiveness response condition? It is assumed here that in the absence of a specific instruction, behavioral chaos exists unless conspicuous stimuli are present.

CONSUMER INFORMATION SEARCH

The research problem:

Consumer research and marketing is concerned with how consumer's search for information and make decisions in today's supermarkets and media environments. The conviction is that difference between the success and failure of new and existing brands, products and advertisements largely depends on their ability to capture the consumer's attention early, to retain it sufficiently long to allow communication of the key ad message and brand position (Pieters and Warlop, forthcoming). Despite the crucial importance of attention capture and retention for the effectiveness of marketing communication activities, and despite the role that is awarded to attention and exploration processes in models of consumer behavior, the amount of empirical research on the topic has been severely limited until recently.

Webb (1979) in the early days of consumer research labeled this type of research as 'initial processing'.

> The study of information processing can be divided into research pertaining to the acquisition of information necessary to make choices, and research pertaining to how the information, once acquired, is used to make choices (here designated as "central processing"). The acquisition of information can be further subdivided into that pertaining to the active search for information and that pertaining to cognitive and perceptual processes at the time the information is acquired. The former is exemplified in the macromodels of consumer behavior (Engel, Kollat, and Blackwell, 1968; Howard and Seth, 1969; Nicosia, 1966), and in the research on decision sets by Bettman (1974) and others. The latter research, labeled "initial processing" research by Ray (1974), focuses on those processes that occur during and just after stimulus exposure to information, up to and including short-term memory. Further processing of information committed to long-term memory would fall under the heading of central processing. Thus, a temporal distinction can be seen between information search, initial processing and central processing. (Webb, 1979, p. 225)

The relevant question(s):

How do consumers visually explore their environment? In this case, environment should be viewed broadly and includes newspaper/magazine advertising, Internet advertising, product packaging and in-store displays and promotions. What is the impact of the consumers' intention or motivation on visual orientation? What is the impact of limited opportunity to process stimuli, or what is the impact of increasing the opportunity by repetition on visual search behavior?

The general finding:

Pieters and his colleagues (Pieters, Rosbergen and Hartog, 1996; Pieters, Warlop and Hartog, 1997; Pieters and Warlop, 1999, Pieters, 1999; Rosbergen, Pieters, and Wedel, 1997; Wedel and Pieters, 2000) have shown interesting findings. He and his co-authors in particular make use of the recent developments in eye-tracking methodologies that have stimulated this line of research. Eye-movements are considered a valid proxy of attention (see also Krugman, Fox, Fletcher, Fisher and Rojas, 1994; Tolley and Bogart, 1994; Young, 1984). Pieters and his fellow researchers gathered eye-tracking data and elucidated -over various studies-, three different visual scan patterns. These scan paths were denoted as (1) acceleration, (2) filtration and (3) strategy shift. Acceleration occurs when consumers speed up information collection and processing. Acceleration was demonstrated by the reduced average duration of individual eye fixations on the stimulus. Filtration occurs when consumers become more selective. Filtration was demonstrated by showing that consumers skip certain elements of information about the brands in the stimulus. Strategy shift occurs when consumers adopt modes of information acquisition that are faster and easier to implement. Saccades within brands, which indicate information acquisition by brand, and saccades between brands, which indicate information acquisition by attribute, demonstrated the strategy shifts.

The proposed theoretical explanation:

The theoretical explanation is found in the functional strategic approach to attention. As pointed out earlier, this approach deals with the question what determines the next fixation. Is the consumer in control or does the stimulus environment take over, respectively known as voluntary or involuntary attention. Pieters and Warlop (1999) draw the distinction between control of attention at the global level and control at the local level. The explanation put forward is biased to control at the global level, in which factors such as motivation and opportunity influence how the stimulus is scanned. In contrast, local factors, are due to the relative salience of individual stimuli. Pieters and colleagues conceptualize attention as a 'window' or 'spotlight' that locally improves the speed and reduces the thresholds for processing events. This points to Kahneman's (1973) capacity theory of attention as is explicitly referred to in Rosbergen, Pieters, and Wedel (1997).

Comments:

First of all, the main question in the present discussion should focus on whether eye movements depend on attentional shifts (see Sanders and Donk, 1996). Logically plausible, eye movements and attention might be fully dependent or fully independent of each other. Experiments have shown, however, that 'attention' can be moved to different parts of the visual field in the

absence of overt eye movements (e.g., Eriksen and Eriksen, 1974; Posner, 1980). Experiments have shown as well that perception of a stimulus was facilitated when subjects were prepared to make an eye movement towards that stimulus (Crovitz and Davies, 1962). "The less extreme possibility would be that, at some stage of their execution, the processes involved in generating eye movements and attention share a common element; execution of either process might then be facilitated or inhibited by the other depending on their spatial goals" (Sanders and Donk, p. 60). This position is seemingly adopted in consumer research, "Although there is not a complete one-to-one correspondence between eye position and attention (VanderHeijden, 1992), it is generally assumed that "where the eyes go, so goes attention (...)"" (Pieters, Rosbergen and Hartog, 1996, p. 242). Instead of the term visual attention the term visual orientation seems more appropriate [14].

Secondly, the theoretical explanation of the observed data, i.e., the eye movement scan paths is given by Kahneman's capacity theory of attention. From what we have outlined in the second chapter we have learned that most students of attention abandoned the idea that capacity limits are due to a scarcity of general, unspecific capacity (Neumann, 1987). In other words, the theoretical rationale for explaining the experimental findings is rather meager. Further, the terms associated with the three scan paths indicate more a (re)description of the observed facts than to an explanation of the eye movement patterns. To put it differently, the terminology viz. filtering, acceleration, and strategy shift suggest an explanation where there may be actually only a redescription of the same attentional phenomenon.

The view according to the ASM:

On the one hand, the ASM does not predict particular scan paths. On the other hand, the ASM does predict conspicuity effects of ad attributes under conditions of the opportunity to process the stimuli and intention (goal-directed or exploratory). The ASM, therefore, explains at the global level, in which factors such as motivation and opportunity influence how the stimulus is scanned (goal-directed or exploratory) and predicts effectiveness responses due to the relative salience of individual stimuli. In contrast to attentional explanations at the global or local level, the surplus value of the ASM is found at the explanation, prediction, and understanding at the global and local level.

A new direction of research:

An important topic for future research is the combination of visual search behavior (eye movement measures) and selective attention. In particular, more focus should be given to the theoretical explanation, rather than description, of eye-movement data patterns. If we are able to theoretically understand how, when and why our eyes move the way they do then we might be able to examine the communication value of the consumer environment by manipulating its spatial layout (e.g., in-store displays, a newspaper with ads, supermarket shelves). By rearranging the spatial layout of the items in the display one might influence the consumer's visual orientation search strategy. If one is able to steer the consumer' visual search process into an exploratory visual search strategy, one has the opportunity to increase the probability for some items, i.e.

14 The term visual orientation came up during the 1998 ACR roundtable discussion regarding consumer research and eye movement methodologies.

the conspicuous ones to be selected (for action, for memory) over others, i.e., the inconspicuous. Obviously, this may have important marketing implications.

THE INFORMATION PROCESSING OF VISUALS AND TEXT IN ADS

The research problem:

Typically, ads contain a few common elements such as a headline, a pictorial, a body text, and a packshot. At the one extreme these ad elements may relate to each other; at the other extreme they may not relate to each other at all. Suppose for now, that one of the elements does not relate to the other elements in the ad. For example, the pictorial is not related to the headline, the body text and the packshot. In other words, the pictorial as compared with the textual elements in the ad is incongruent. It is important to note that it is the meaning of the pictorial that is different from the meaning of the textual elements. In this case, the research problem relates to what extent congruency or incongruency between elements in an ad may impact the processing and effectiveness of the ad. This issue has been addressed frequently in consumer research literature and one of the underlying theoretical rationales is found in resource theory (e.g., Meyers-Levy and Peracchio, 1992; Meyers-Levy and Peracchio, 1995; Meyers-Levy and Sternthal, 1993; Peracchio and Meyers-Levy, 1994). Other related research involves the kind of processes that are put into action to process visual or verbal information (e.g., Janiszewski, 1988). The effects of (in)congruence between ad elements and the processing of visual and verbal information on changes in attitudes appears to be an important issue to the discipline of marketing and consumer behavior research.

The relevant question(s):

The questions that guide the first type of research are directed to elucidate the effects of incongruence between ad elements on attitudes and evaluations of marketing communications. The questions belonging to the second type of research deal with the differential effects between visual and verbal information in advertisements on brand attitudes and evaluations of marketing communications.

The general findings and the proposed theoretical explanations:

Two kinds of effects are found in consumer judgements of objects vis-à-vis contextual factors; these effects are known as assimilation and contrast effects (Meyers-Levy and Sternthal, 1993). Three different views have been offered to account for and explain these effects. One view suggests that the extent of overlap between the target object and context determines whether assimilation or contrast is found (Herr, 1989). The second view suggests the allocation and the amount of cognitive resources devoted to the judgemental task (Martin, Seta, and Crelia, 1990). The third view combines the two suggestions. The emerging view is that contrast effects occur when there is both a small contextual - target object overlap and people devote substantial resources to the task. The assimilation effect occurs when the resources applied to the task are limited, and/or when overlap between context and target object is large (Meyers-Levy and Sternthal, 1993).

The first view explains both contextual effects by a categorization process. Both target object and contextual object(s) are categorized. If the features of both target and context show considerable overlap, the target object will be categorized as a member of the same category and assimilation occurs. When the category activated by the contextual objects and the target object show little or no overlap in features, contrast occurs (Herr, Sherman, and Fazio, 1983).

The second view suggests that the level of cognitive resources expended in making a judgement also plays an important role in determining the nature of the resulting context effect (Martin, Seta, and Crelia, 1990). "People with a high need for cognition were found to inhibit a contrast effect, whereas people with a low need for cognition expended the effort necessary to suppress associations to the contextual cues and to interpret the target object in terms of alternate and antithetic associations, thereby encouraging a contrast effect" (Meyers-Levy and Sternthal, 1993, p.360. Note that need for cognition was used as an indicator for the amount of cognitive resources devoted to the judgemental task.

The third view "represents theoretical progress by showing that context effects may be better explained when Herr's notion of overlap and Martin's concept of cognitive effort are integrated in a two-factor theory than when either of these notions is considered in isolation" (Meyers-Levy and Sternthal, 1993, p. 366)

With respect to the processing of visual and verbal information as such, a different theoretical explanation has been given. Note that here the congruency is not of interest but the simple fact that an ad constitutes pictorial and verbal information.

> "Though it has been proposed that attitude formation is a cognitive process involving focused conscious attention (Fischbein and Azjen, 1975; Hastak and Olson, 1989; Lutz, 1975, 1977; Olson et al., 1982), recent literature in psychology and marketing proposes that attitudes can also be formed preattentively (Dixon, 1981; Janiszewski, 1988; Kihlstrom, 1984, 1987; Moreland and Zajonc, 1977; Wilson, 1979). In an advertising context, for example, Janiszewski (1988) showed that ad attitudes can be influenced when information in the ad is processed at a preattentive level, and that some relationship exists between the nature of the material to be processed (visual vs. verbal) and the dominant hemisphere in which the information is processed (right vs. left). (...) The two hemispheres of the brain have been shown to use two different processing styles (Bouma, 1978; Sergent, 1983). The right brain is said to have holistic style, allowing the simultaneously integration of multiple pieces of information. This hemisphere uses a template matching process, invoking a template to give meaning to incoming information (Janiszewski, 1988). Because of this holistic processing style, the right hemisphere is more compatible than the left with processing pictorial stimuli. The left hemisphere is described as unit-integrative, as it combines well-learned individual units into a meaningful whole (Janiszewski, 1988). Because of the unit-integrative style, the left hemisphere is more compatible with the processing of verbal stimuli. (...) Contralateral conduction refers to the fact that stimuli observed in the right visual field are processed in the left hemisphere of the brain, while stimuli in the left visual field are processed in the right hemisphere. Combined with the difference in hemispheric processing styles noted above, this phenomenon implies that visual stimuli presented in the left visual field should receive greater processing than verbal stimuli presented in the left visual field. Conversely, verbal stimuli presented in the right visual field should receive greater processing than verbal stimuli presented in the same field." (Shapiro and MacInnis, 1992, p. 505/6)

Comment(s):

In the first type of research, congruence is based upon the meaning of the elements of interest. The meaning of the textual is compared with the meaning the pictorial aims to communicate. Congruence in these studies focuses on the cognitive processes at the time the information is acquired. According to Webb (1979) this research can be denoted as central processing research. It would be consistent with Webb to suggest similar research in initial processing. Regarding the meaning of elements within an ad the pictorial can be textually characterized, so the textual can be characterized visually.

The second type of research is clearly initial processing research. It is important to note that the background of this type of research (although not explicitly referred to in the cited and related papers) is found in the observations how physical damage to the brain in different locations causes losses or distortions of motives, wishes, skills, feelings. Cerebral commissurotomy (a division of the corpus callosum), the split-brain operation, has been performed to stop non-functional neural discharges going from one hemisphere to the other. Psychological tests performed by Gazzaniga and others revealed that while the general psychological state and behavior was, in most cases, little affected, there was a profound change in the patient's mental activities. Research with normal subjects shows that individuals vary greatly in the development if asymmetrical functions in their brains and in the ways the hemispheres are habitually activated (Gregory, 1987). Experimentally one should occlude one eye to prevent double vision and present the visual stimuli for very short exposure durations at the left and right of a fixation point. It is mainly in the methods where consumer research studies slip-up, exposure durations are too long and verbal and pictorial information is not presented left and right relative to a fixation point.

The view according to the ASM:

In contrast with the rather cognitive processing explanation for the first type of research, i.e., solving the incongruence, the ASM suggest that conspicuous items have different selection probabilities by default unless processing strategies overrule the default settings. In addition, the time consumers are exposed to the material of interest showed that the effectiveness of conspicuous elements may differ. This might suggests that on the basis of 'initial processes' an explanation can be found regarding distinctive or incongruent items in the consumer environment. Regarding the second type of research, i.e., the processing of verbal and pictorial information, the ASM considers that both verbal and pictorial information can be selected at the where level and at the what level.

A new direction of research:

First, the inclusion of the following experimental conditions can easily extend congruence research. The (in)congruence between the text (or picture) and the picture (or text) that can be (1) inconspicuous, (2) visually conspicuous, (3) cognitively conspicuous, and (4) visually +cognitively conspicuous relative to the text. Second, the extent of (in)congruency between the items that constitute an ad looks like a promising area for future research. The ASM suggests the examination of two kinds of incongruency viz. visual and cognitive. The issue of 'extent of congruency' has not been dealt with in this thesis. On the other hand, suggestions have been

made in the literature to quantify the level of visually conspicuous items present in a scene (for good starting points see Engel, 1972, 1976, 1977; Kooi and Valeton, 1994; Sanders and Donk, 1996). The applications are found in, for example, traffic and the military and deal with the increasing the conspicuity of individual items (e.g. traffic signs) or decreasing their conspicuity (e.g., military objects) in the visual scene. These applications can be easily extended to advertising and package appearance enbedded in, for example, newspapers and in-store displays, respectively. To quantification of the degree of cognitive conspicuity of items seems more complicated. To my knowledge, these kinds of measures are not available. One might think to measure reaction times to a target stimulus just presented after a set of contextually related and not related items. If the target stimulus is related (inconspicuous) to the context, then the reaction time is expected to be faster than for not related (conspicuous) items. The inverse of the target's reaction time is a possible measure for its cognitive conspicuity.

Regarding the second type of research, i.e., the processing of verbal and pictorial information, it would be interesting to examine both distinctions simultaneously, i.e., between where and what level at the one hand and left and right hemisphere at the other hand. Experimentally, the split-brain setup should be followed (mono vision, short exposure durations). The interest lies more in the theoretical explanation of the observed findings than in the direct marketing implications how to rearrange spatial layout on the basis of hemispheric processing.

Berlyne regarding works of art, nicely describes the importance of this type of research:

> "All art has an important formal aspect, giving rise to syntactic information transmission the appreciator must to some extent be responding to relations between the physical properties of different elements. But many works of art also transmits semantic information, which is identifiable with what we call 'content'; it might be representational (as in painting, drama, ballet, and even in some music) or linguistic (as in literature). To some extent, therefore, the appreciator's responses must also be determined by properties of the objects or events that are depicted or described." (Berlyne, 1971, p. 150/1)

BRAND SALIENCE AND CONSIDERATION SET INCLUSIONS TO CHOICE

The research problem:

The topic of salience, in particular stimulus salience, is of interest to consumer researchers as can be observed in basically all textbooks of consumer behavior. Two kinds of salience are recognized. There is perceptual salience and memory salience. Perceptual salience is based on the visual characteristics of the stimulus (Garber, 1995), and the "level of memory activation" determines the salience of items that are stored in memory (Alba and Chattopadhyay, 1986). Another interesting aspect of salience pertains to the stimulus itself. By their nature, some events are more salient than others are. One may argue that there is relative salience, understood by its visual distinctiveness or level of activation vis-à-vis its contextual elements and absolute salience (or vividness) understood by the inherent properties of the stimulus itself. We limit ourselves here to relative stimulus salience.

The concept of salience has been suggested to be important for (1) advertising effectiveness (Alba, Hutchinson and Lynch, 1991), (2) the effect on visual search routines (Janiszewski, 1997),

(3) the formation of consideration sets, and the formation of the appearance of brands in their packages at the point of purchase (Garber, 1995), and (4) the design of effective marketing communication strategies (Ratneshwar, Warlop, Mick, and Seeger, 1997). The relevant empirical research on brand name salience is scarce, however (Alba and Chattopadhyay, 1986). Though we all know and accept the notion that the visual and graphical aspects of the product or service have an impact on consumer choice at the point of purchase, little is known or understood about how the effect is produced- there is virtually nothing in the academic literature on the topic (Garber, 1995).

The findings:

Alba and Chattopadhyay (1986) demonstrated that increasing the memory salience of a single brand might significantly impair unaided recall of competing brands. Barlow and Wolgater (1993), in empirical work on alcohol warnings, found that presentation style in print ads makes a significant difference with respect to whether the warnings are seen and remembered. They concluded that a warning must be conspicuous to be seen and remembered (see also, Krugman, Fox, Fletcher, Fisher and Rojas, 1994).

The relevant question(s):

What are the effects of stimulus salience on memory and to what extent does memory salience affect the recall of other items?

The proposed theoretical explanation:

Alba and Chattopadhyay (1986) account for their memory salience findings by referring to the part-category cuing effect as an instance of a more general phenomenon known as output interference. "In essence, output interference refers to the notion that recall of a subset of any information results in the decreased probability of recalling the remainder of that information. Part-category cuing represents a special case of output interference in which the "recalled" subset is provided in advance of recall" (Alba and Chattopadhyay, 1985, p. 340).

Perceptual salience effects have been understood by suggesting that the significance of a distinctive item produces greater cognitive elaboration and, hence, greater influence for the salient information (cf. Hastie, 1984). Garber (1995) proposes a staged model of choice that explicitly considers the role of visual perception and package appearance in formation of the consideration set at the point of purchase. More specifically, the formation of a visually oriented attention set is conceived to precede and affect formation of a subsequent product-benefits-oriented consideration set. The suggestion is that visually typical brand alternatives are more likely to be noticed and preferred by the consumer (Loken and Ward, 1990), and will likely be chosen for purchase unless some distracting stimulus or event interrupts and changes the decision process. The distracting brands are called visually novel (Garber, 1995). Jones and McGilles (1976) depart from the correspondent-inference theory as a meaningful basis for classifying connotations for many commonly used semantic cues. According to this theory, consumers are more likely to elaborate (1) information that is inconsistent with previous information or (2) information that is distinct from other present information. Thus,

inconsistent and distinctive information will have more effect on perceptions than information connoting high consistency or low distinctiveness.

Comments:

Somehow the theoretical explanations provided seem tautological - perceptual salient objects affect effectiveness positively because they are perceptually distinct. The important question to address is why perceptually salient stimuli stimulate a memory effect, however (Shanker and Shapiro, 1996). This question is still unaddressed as are the questions how and when salient stimuli stimulate memory effects. In addition, as the empirical part of this thesis has shown, differential recognition accuracy effects can be observed if one distinguishes explicitly between stimuli that are visually salient or cognitively salient. Regarding memory salience the notion of output interference is interesting and might fit nicely if associated with the ideas about the functional relationship between input and output related processes.

The view according to the ASM:

The ASM is related to these types of studies. The question why salient stimuli stimulate memory effects is dealt with in the second chapter. In addition, the ASM provides answers to the how and when a salient stimulus stimulates a memory effect question as well.

A new direction of research:

The ASM points to the possibility to examine the stimulus salience effect vis-à-vis contextual brands directly on memory thereby combining the research approaches on perceptual salience and memory salience. It is suggested here to study both salience effects when the functional relationship between input and output related processes is considered.

BRAND CONSPICUITY AND MOA INFORMATION PROCESSING MODELS

The problem:

It is well known that a myriad of advertising research findings showed that numerous advertising executional variables can influence advertising effectiveness (e.g., MacInnis & Jaworski, 1989). Later on, (parallel) related research underlined that advertising effectiveness is preceded by more generic construct variables, i.e. consumers' motivation, opportunity, and ability (MOA) to process commercial information (e.g., Andrews, 1988; Batra & Ray, 1986; MacInnis & Jaworski, 1989; Petty & Cacioppo, 1986; Poiesz, 1989, 1999; Poiesz and Robben, 1994; Robben and Poiesz, 1993). However, research explicitly linking advertising executional variables to MOA or, conversely, MOA to advertising executional variables is scarce (e.g., MacInnis, Moorman & Jaworski, 1991; Petty, Unnava & Strathman, 1991).

MacInnis, Moorman & Jaworski (1991, see also MacInnis & Jaworski 1989; Petty & Cacioppo 1986) identify two roles for advertising executional variables by adjoining them to MOA. Its first role can be characterized as 'matching advertising executional variables to information processing construct variable levels' to be distinguished from its second role which can be characterized as 'changing the construct variable level of processing through the use of

advertising executional variables'. This means that advertising executional variables can serve as arguments or cues regarding its first role and can affect the nature or extent of information processing antecedents regarding its second role (Petty, Unnava & Strathman, 1991).

The relevant question(s):

Why and when (e.g., under what conditions) does the same advertising executional variable serve as a cue or an argument? Similarly, why and when does an advertising executional variable change the construct variable level (motivation, ability and opportunity to process) of processing?

The proposed theoretical explanation:

The underlying theoretical explanation is offered by resource theory. The allocation of resources depends on the motivation, ability and opportunity to process the commercial stimuli. In turn, the extent of resource allocation directs the level of information elaboration. The consumer follows a peripheral (heuristic) processing route under low information elaboration and a central (systematic) processing route is followed under a high level of information elaboration. It is well accepted in consumer research that resource theory provides an important theoretical explanation to all different kinds if consumer phenomena (Tybout, 1995).

> "Perhaps the most important contribution of the [MOA related, note by author] research is the theoretical insight it provides concerning elaboration-likelihood theory. Specifically, the findings show that a single cue - in this case, color - can be processed either as a substantive resource-consuming "central" cue or as a less resource-demanding "peripheral" cue, depending on a viewer's processing motivation. Thus, the implication is that the same cue can be either central or peripheral. Further, the finding suggests that resource demands versus availability is the true construct underlying elaboration-likelihood theory and the central-peripheral processing notions. Whether a viewer is motivated, able, and has the opportunity to engage in detailed "central processing" in fact depends on both the resources available for processing and the resource demands imposed by the stimulus and context. Accordingly, we observed that when the resource demands imposed by difficult-to-substantiate ad claims, together with the presence of color, imposed very high resource demands, highly motivated viewers did not engage in central processing, which resulted in an undermining of their persuasion". (Meyers-Levy and Peracchio, 1995, p. 136)

Comments:

First, the critical notions concerning resource theory given by Navon (1984, 1985) as one of the first proponents of this theory are in strident contrast with the contemporary belief in consumer research that it provides a valid explanation. It is unfortunate that Navon's papers were not given the attention in consumer research (see for one rare exception Owen, 1991, 1992) as they were given in perception research. Second, a puzzling intricacy regarding the second role of 'changing the construct variable level of processing through the use of advertising executional variables' emerges when so-called reciprocal or trade-off effects are considered as well. Reciprocal or trade-off effects refer to advertising executional variables, which positively affect one information processing construct antecedent but at the same time negatively affect another (MacInnis, Moorman & Jaworski, 1991). Note that the definition and operationalization of the antecedents are important here. It has been argued that the generic level definitions are

frequently operationalized at specific or detailed levels (Robben and Poiesz, 1993). How to measure these construct antecedents has been debated as well (MacInnis, Moorman and Jaworski, 1991). For example, should we depart from objective measurements of MOA constructs or should we assess how consumers subjectively perceive these MOA factors? In the latter situation a single advertising executional variable may influence all MOA-factors positively or negatively and all combinations in between (Poiesz, 1999).

The view according to the ASM:

The ASM provides the possibility to examine the effectiveness of executional variables at a detailed level while leaving room for more generic interpretations. It is recognized, however, that the ASM is limited because it does not hypothesize the total brand name recognition accuracy effects, which are predicted by MOA models. On the other hand, MOA models can only argue that conspicuous brand names take the role of cues or arguments on an ad hoc basis. The reason is that given the 'logic' of MOA one must predict higher recognition accuracy effects for all brand names including the conspicuous brand names under high levels of motivation, ability and opportunity. Like MOA models, the ASM considers the distinction between intentional (goal-directed) behavior and unintentional (exploratory) behavior. Depending upon the level of intention (motivation) different brand name conspicuity effects on recognition accuracy were found. Depending on the level of stimulus exposure duration (opportunity), different brand name conspicuity effects on recognition accuracy were found as well. The ability factor, here defined as familiarity with the stimulus brand names, was held fixed. Higher recognition accuracy was found at generic high levels of motivation, opportunity, and ability for all brand names. In other words, the ASM predicts conspicuity effectiveness at a detailed and a generic level and MOA predicts brand name effectiveness effects at a generic level.
The ASM does not account for the argument presented in consumer research that executional variables such as the conspicuousness of brand names might influence the construct antecedent levels. It seems hard to find a theoretical account to explain how a conspicuous brand name may influence, for example, the opportunity (stimulus exposure duration) factor.

A new direction of research:

Future research should explore more carefully the underlying processes that are operating, which are imperative for any thorough theoretical analysis. MOA models offer a general account in an attempt to understand how consumers with varying degrees of processing motivation, ability and opportunity deal with single advertising attributes (Meyers-Levy and Peracchio, 1992). Given prediction over post hoc explanation, one should focus on hypothesizing effectiveness regarding various executional variables under different levels of M, O, and A. If one adopts this simple experimental setup systematically one has the advantage to compare results between studies, which ultimately may enhance theoretical progress.

OVERALL CONCLUSION

First, our findings contribute to consumer research by proposing the attention-selection-model (ASM) as a single model of attention as opposed to a number of classic models of attention that underlie contemporary conceptualizations of (selective) attention. The latter all can be criticized on inconsistencies.

Second, our findings contribute to consumer research by suggesting how, when, and why selective attention may reveal itself.

Third, our findings contribute to consumer research by the examination of brand name conspicuity on memory effectiveness.

Fourth, our findings contribute to consumer research by suggesting new research possibilities or other ways to look at findings regarding some longstanding consumer behavior research issues.

Finally, it is recognized that there is an enormous gap between the structure and strategies of the brain and the marketer who is confronted with the task of breaking his ad through the advertising clutter. To be sure, I have done my best to partly fill this gap and not to omit matters that the consumer researcher may consider important.

REFERENCES

Some remarks

For clarity, the listed references are categorized into four sections viz. (1) References from the Mind & Brain Research; (2) References from Visual and Auditory Perception Research, (3) References from Consumer Behavior Research, and (4) some of my own papers and posters. Some of these references were not explicitly referred to. They are provided anyway since they shaped my mind and might be of interest for consumer researchers as well. Some other references are not listed per se. The interested reader is able to locate these particular references in the provided original source.

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- DeHeer, Johan (submitted). Toward a functional conceptualization of attention: The why, how and when of attentional selection. *Working paper*, Department of Economic and Social Psychology, Tilburg University, The Netherlands.

- DeHeer, Johan (submitted). The influence of visually and cognitively conspicuous brand namers via attentional selection on recognition memory. *Working paper*, Department of Economic and Social Psychology, Tilburg University, The Netherlands.

- DeHeer, Johan (submitted). A review of attention is consumer research. *Working paper*, Department of Economic and Social Psychology, Tilburg University, The Netherlands.

- DeHeer, Johan (2001). The attention selection model: The effectiveness of conspicuous brand names. *Ph.D. dissertation*, Tilburg University, The Netherlands.

CONFERENCE VISITS

- Nijmegen Institute for Cognition and Information (NICI): "Perception of Structure", Feb. 9-12 1993, Nijmegen, The Netherlands (visiting)

- Association for Research in Vision and Ophthalmology (ARVO), May 1993, Sarasota, Florida, USA (poster presentation)

- National day of Science, October, 1994, TNO Institute for Human Factors, Soesterberg, The Netherlands (demonstrations on color perception)

- International Association for Research in Economic Psychology (IAREP), Sept. 1997, Valencia, Spain (paper presentation)

- Association for Consumer Research (ACR), Oct. 15-19 1997, Denver, Colorado, USA (paper presentation)

- Society for Consumer Psychology (SCP), Winter 1998 SCP Conference, Feb. 19-21 1998, Austin, Texas, USA (paper presentation)

- American Marketing Association (AMA), Winter Marketing Educators' Conference, Feb. 21-24 1998, Austin, Texas, USA (visiting)
- International Association of Applied Psychology (IAAP), August 9-14 1998, San Francisco, California, USA (paper presentation)
- American Marketing Association (AMA), Summer Educators' Conference, Aug. 15-18 1998, Boston, Mass, USA (visiting)
- Association for Consumer Research (ACR), Oct. 1-4 1998, Montreal, Canada (paper presentation at roundtable discussion)
- J.R. Nuttin Lectures, Catholic University Leuven, Dec. 17-18 1998, Leuven, Belgium (visiting)
- Society for Consumer Psychology (SCP), Winter 1999 SCP Conference, Feb. 18-20 1999, St. Petersburg, Florida, USA (2 paper presentations)
- Winter Marketing educators' Conference (AMA), Feb. 20-23 1999, St. Petersburg, Florida, USA (visiting)
- Work & Organization Research Centre (WORC), March 1999, Tilburg University, The Netherlands (presentation for Ph.D.students)
- Center for Economic Research (CentER): Marketing seminar, April 21 1999, Tilburg University, The Netherlands (presentation for select faculty audience)
- Society for Consumer Psychology (SCP), 1999 SCP Conference: Diversity in Advertising, May 20-21 1999, San Antonio, Texas, USA (paper presentation)
- University of Texas at San Antonio: Dep. of Marketing, USA, May 1999 (presentation for select faculty audience)
- Association for Consumer Research (ACR), Sept. 30 - Oct 3 1999, Columbus, Ohio, USA (poster presentation)
- National day of Science, October, 1999, Tilburg University, The Netherlands (demonstration on eye-movement recordings)
- University of Denver, Dec 1999 till March 2000, Denver, Colorado, USA (visiting researcher)
- Society for Consumer Psychology (SCP), 2000 SCP Winter Conference. Feb 2000, San Antonio, Texas, USA (paper and 2 poster presentations)
- Erasmus Food Management Institute (EFMI), May 12 2000, Rotterdam, The Netherlands (invited talk for managers in visual merchandising)
- European marketing Academy Conference (EMAC), May 23-24 2000, Rotterdam, The Netherlands (paper presentation in special session on eye-movements and selective attention)
- Association for Consumer Research (ACR), Oct 19 - 22 2000, Salt lake City, Utah, USA (poster presentation)

Appendix A: The stimuli

Table 1: Inconspicuous targets (⇨)

	Upper left	Upper right	Lower left	Lower right
1	Marlboro	Camel	Caballero	⇨ Duphill
2	Bokma	Flandria	⇨ Heineken	Leader
3	Heineken	⇨ Grolsch	Amstel	Bavaria
4	Volkswagen	Nike	Persil	⇨ Trouw
5	⇨ Levi's	Wrangler	Lee	Trimmer
6	Opel	Ford	⇨ Audi	Mazda
7	Compaq	⇨ Olivetti	Philips	Thomson
8	Pepsi	Sisi	Sprite	⇨ Cassis
9	⇨ Mars	Snickers	Raider	Bounty
10	Sony	Philips	⇨ Grundig	Pioneer
11	Celeste	⇨ Prudent	Pimex	Zendium
12	⇨ Andrelon	Elsève	Palmolive	Fabil
13	Casio	Seiko	⇨ Pulsar	Swatch
14	Pentax	Minolta	Kodak	⇨ Nikon
15	⇨ Tag	Spa	Amex	Visa
16	Jim Beam	⇨ Jack Daniels	Dimple	Believe
17	Drum	Samson	⇨ Van Nelle	Boondoc
18	⇨ Tros	Avro	Ncrv	Vpro
19	Fiets	⇨ Amev	Aegon	Pearl
20	Margriet	Libelle	Flair	⇨ Viva
21	Senza	⇨ Remia	Brio	Bona
22	Diwan	Silan	⇨ Fleurel	Ail
23	⇨ Yamaha	Honda	Kawasaki	Suzuki
24	Nokia	Motorola	Philips	⇨ Ericsson
25	Aldi	Sharp	⇨ Samsung	Aristona
26	Boudnecht	⇨ Siemens	Whirlpool	Elektrolux
27	⇨ Puma	Reebok	Nike	Pummel
28	Lancome	Calvin klein	Nina Ricci	⇨ Escape
29	Kreidler	Puch	⇨ Vespa	Zundapp
30	Lancia	⇨ Fiat	Mercedes	Toyota
31	Bonza	Felix	⇨ Kitekat	Pedigree Pal
32	Duval	Hoogvorden	Corona	⇨ Warsteiner
33	⇨ Sunil	Omo	Biotex	Dobbelman
34	⇨ Lion	Kitket	Bros	Smarties
35	Buitoni	⇨ Knorr & Survit	Mey Heyeker	Prisma
36	Morres	Thea	Goossens	⇨ Lupdia
37	Mozart	⇨ Bach	Brahms	Bartok
38	⇨ Tempo Team	Davidstad	Vedior	Start
39	Gazelle	Batavus	⇨ Balleigh	Koga Miyata
40	Tefal	⇨ Braun	Rosenta	Moulinex
41	⇨ Brie	Camembert	Roquefort	Boursin
42	Arke	Nobe	Ced	⇨ Wagon Lit
43	Esso	Shell	⇨ OB	Bp
44	Texa	Lada	Rover	⇨ Volvo
45	Aeg	⇨ Miele	Zanussi	Indesit
46	Hubo	Gamma	⇨ Praxis	Bouwmarkt
47	⇨ Lacoste	Chanel	Dior	Oil of Olaz
48	Panasonic	Kenwood	Technics	⇨ Dasawa
49	Appelsientje	⇨ Goudappeltje	Zuivelmeisje	Fruitdrupfje
50	Mona	Dona	⇨ Coberco	Danone
51	⇨ Lucky Strike	Barclay	Stuyvesant	Gauloises
52	Pantene	Sanex	Timotei	⇨ Organics
53	Tennis	⇨ Hockey	Volleybal	Voetbal
54	Cosmopolitan	Boss Monde	⇨ Elegance	Quelle
55	Dubro	Neutral	Klok	⇨ Droft
56	⇨ Weekend	Privé	Story	Mijn Geheim

Table 2: Inconspicuous targets (→)

Upper left	Upper right	Lower left	Lower right
Marlboro	Camel	Caballero	→ Duphill
Bokma	Flandria	→ Heineken	Leader
Heineken	→ Grolsch	Amstel	Bavaria
Volkswagen	Nike	Persil	→ Trouw
→ Levi's	Wrangler	Lee	Trimmer
Opel	Ford	→ Audi	Mazda
Compaq	→ Olivetti	Philips	Thomson
Pepsi	Sisi	Sprite	→ Cassis
→ Mars	Snickers	Raider	Bounty
Sony	Philips	→ Grundig	Pioneer
Celeste	→ Prudent	Pimex	Zendium
→ Andrelon	Elsève	Palmolive	Fabil
Casio	Seiko	→ Pulsar	Swatch
Pentax	Minolta	Kodak	→ Nikon
→ Tag	Spa	Amex	Visa
Jim Beam	→ Jack Daniels	Dimple	Believe
Drum	Samson	→ Van Nelle	Boondoc
→ Tros	Avro	Ncrv	Vpro
Fiets	→ Amev	Aegon	Pearl
Margriet	Libelle	Flair	→ Viva
Senza	→ Remia	Brio	Bona
Diwan	Silan	→ Fleurel	Ail
→ Yamaha	Honda	Kawasaki	Suzuki
Nokia	Motorola	Philips	→ Ericsson
Aldi	Sharp	→ Samsung	Aristona
Boudnecht	→ Siemens	Whirlpool	Elektrolux
→ Puma	Reebok	Nike	Pummel
Lancome	Calvin klein	Nina Ricci	→ Escape
Kreidler	Puch	→ Vespa	Zundapp
Lancia	→ Fiat	Mercedes	Toyota
Bonza	Felix	→ Kitekat	Pedigree Pal
Duval	Hoogvorden	Corona	→ Warsteiner
→ Sunil	Omo	Biotex	Dobbelman
→ Lion	Kitket	Bros	Smarties
Buitoni	→ Knorr & Survit	Mey Heyeker	Prisma
Morres	Thea	Goossens	→ Lupdia
Mozart	→ Bach	Brahms	Bartok
→ Tempo Team	Davidstad	Vedior	Start
Gazelle	Batavus	→ Balleigh	Koga Miyata
Tefal	→ Braun	Rosenta	Moulinex
→ Brie	Camembert	Roquefort	Boursin
Arke	Nobe	Ced	→ Wagon Lit
Esso	Shell	→ OB	Bp
Texa	Lada	Rover	→ Volvo
Aeg	→ Miele	Zanussi	Indesit
Hubo	Gamma	→ Praxis	Bouwmarkt
→ Lacoste	Chanel	Dior	Oil of Olaz
Panasonic	Kenwood	Technics	→ Dasawa
Appelsientje	→ Goudappeltje	Zuivelmeisje	Fruitdrupfje
Mona	Dona	→ Coberco	Danone
→ Lucky Strike	Barclay	Stuyvesant	Gauloises
Pantene	Sanex	Timotei	→ Organics
Tennis	→ Hockey	Volleybal	Voetbal
Cosmopolitan	Boss Monde	→ Elegance	Quelle
Dubro	Neutral	Klok	→ Droft
→ Weekend	Privé	Story	Mijn Geheim

Table 3: Cognitively conspicuous targets (⇨)

	Upper left	Upper right	Lower left	Lower right
1	Marlboro	Corsel	Gabellere	⇨ Samsonite
2	Bolmo	Plenin	⇨ Saab	Lenor
3	Heineken	⇨ Duovis	Amstel	Bavaria
4	Volkswagen	Nivea	Persil	⇨ C1000
5	⇨ Zwitsal	Wrangler	Lee	Trimm
6	Opel	Ford	⇨ Duracell	Mazda
7	Compaq	⇨ Pickwick	Pagen	Ibm
8	Persil	Sisi	Sunita	⇨ Hister
9	⇨ Tdk	Snickers	Raider	Beauty
10	Sony	Philips	⇨ Tele	Pioneer
11	Celeste	⇨ Knorr	Elnex	Zendium
12	⇨ Chiquita	Flavex	Palmolive	Bahl
13	Cassio	Seiko	⇨ Venz	Switch
14	Pentax	Minolta	Kodak	⇨ Bonduelle
15	⇨ Milka	Sea	Amro	Vib
16	Tim Boom	⇨ Tetrabin	Pizzale	Bolleye
17	Prism	Samson	⇨ Ola	Bronderie
18	⇨ Nilfisk	Avro	Navy	Kro
19	Pluto	⇨ Persil	Aegon	Basal
20	Margaret	Libelle	Flair	⇨ Garbazzio
21	Sanex	⇨ Kim	Bria	Bono
22	Nivea	Silon	⇨ Droste	All
23	⇨ Campina	Honda	Kawasaki	Suzuki
24	Nokia	Motorola	Profoon	⇨ Maxi
25	Aloe	Shara	⇨ Calve	Aristona
26	Boulevard	⇨ Nuts	Whirlpool	Elektrolux
27	⇨ Unox	Reebok	Nike	Russow
28	Lancome	Calvin klein	Nina Ricci	⇨ Silva
29	Kreidler	Puch	⇨ Odorex	Zundapp
30	Lancia	⇨ Libresse	Mercedes	Toyota
31	Ronzo	Felix	⇨ Nutricia	Pedigree Pal
32	Dunel	Honeywell	Corona	⇨ Mascotte
33	⇨ Fokker	Opa	Bistos	Dobbelmon
34	⇨ Pepsi	Kitket	Bros	Smarties
35	Bolkrap	⇨ Uni Cura	Max Havelaar	Prisma
36	Marrea	Tiwi	Snoozers	⇨ Flavier
37	Mozart	⇨ Natreen	Brabrus	Bactik
38	⇨ Vico	Randstad	Vadior	Start
39	Gazelle	Bolmoo	⇨ Budweiser	Koor Mineta
40	Tefal	⇨ Hema	Rosseta	Mediraz
41	⇨ CZ Groen	Camembert	Pacomfort	Bourgin
42	Arbo	Nibbs	Ced	⇨ Tif
43	Fram	Shell	⇨ Ptt	Bo
44	Teso	Lada	Bmw	⇨ Mora
45	Aeg	⇨ Croky	Tomcat	Tadent
46	Hobo	Bonzoo	⇨ Gillette	Bouwmarkt
47	⇨ Brabantia	Chanel	Dior	Oil of Olaz
48	Panasonic	Kenwood	Technics	⇨ Ketex
49	Annelsientje	⇨ Black & Dekker	Zantemantje	Printbrijtje
50	Mono	Nomo	⇨ Microsoft	Panana
51	⇨ Cornetland	Barclay	Shroosant	Goulaise
52	Pantene	Senex	Timotei	⇨ Moorum
53	Tennis	⇨ Vamona	Volleybal	Vaethal
54	Cosmopolitan	Beau Monde	⇨ Tsastar	Cluete
55	Hobro	Neutral	Klok	⇨ Martinair
56	⇨ Adidas	Prive	Story	Mijn Geheim

Table 4: Visually+cognitively Conspicuous targets

Upper left	Upper right	Lower left	Lower right
Marlboro	Corsel	Gabellere	⇨ Samsonite
Bolmo	Plenin	⇨ Saab	Lenor
Heineken	⇨ Duovis	Amstel	Bavaria
Volkswagen	Nivea	Persil	⇨ C1000
⇨ Zwitsal	Wrangler	Lee	Trimm
Opel	Ford	⇨ Duracell	Mazda
Compaq	⇨ Pickwick	Pagen	Ibm
Persil	Sisi	Sunita	⇨ Hister
⇨ Tdk	Snickers	Raider	Beauty
Sony	Philips	⇨ Tele	Pioneer
Celeste	⇨ Knorr	Elnex	Zendium
⇨ Chiquita	Flavex	Palmolive	Bahl
Cassio	Seiko	⇨ Venz	Switch
Pentax	Minolta	Kodak	⇨ Bonduelle
⇨ Milka	Sea	Amro	Vib
Tim Boom	⇨ Tetrabin	Pizzale	Bolleye
Prism	Samson	⇨ Ola	Bronderie
⇨ Nilfisk	Avro	Navy	Kro
Pluto	⇨ Persil	Aegon	Basal
Margaret	Libelle	Flair	⇨ Garbazzio
Sanex	⇨ Kim	Bria	Bono
Nivea	Silon	⇨ Droste	All
⇨ Campina	Honda	Kawasaki	Suzuki
Nokia	Motorola	Profoon	⇨ Maxi
Aloe	Shara	⇨ Calve	Aristona
Boulevard	⇨ Nuts	Whirlpool	Elektrolux
⇨ Unox	Reebok	Nike	Russow
Lancome	Calvin klein	Nina Ricci	⇨ Silva
Kreidler	Puch	⇨ Odorex	Zundapp
Lancia	⇨ Libresse	Mercedes	Toyota
Ronzo	Felix	⇨ Nutricia	Pedigree Pal
Dunel	Honeywell	Corona	⇨ Mascotte
⇨ Fokker	Opa	Bistos	Dobbelmon
Pepsi	Kitket	Bros	⇨ Smarties
Bolkrap	⇨ Uni Cura	Max Havelaar	Prisma
Marrea	Tiwi	Snoozers	⇨ Flavier
Mozart	⇨ Natreen	Brabrus	Bactik
⇨ Vico	Randstad	Vadior	Start
Gazelle	Bolmoo	⇨ Budweiser	Koor Mineta
Tefal	⇨ Hema	Rosseta	Mediraz
⇨ CZ Groen	Camembert	Pacomfort	Bourgin
Arbo	Nibbs	Ced	⇨ Tif
Fram	Shell	⇨ Ptt	Bo
Teso	Lada	Bmw	⇨ Mora
Aeg	⇨ Croky	Tomcat	Tadent
Hobo	Bonzoo	⇨ Gillette	Bouwmarkt
⇨ Brabantia	Chanel	Dior	Oil of Olaz
Panasonic	Kenwood	Technics	⇨ Ketex
Annelsientje	⇨ Black & Dekker	Zantemantje	Printbrijtje
Mono	Nomo	⇨ Microsoft	Panana
⇨ Cornetland	Barclay	Shroosant	Goulaise
Pantene	Senex	Timotei	⇨ Moorum
Tennis	⇨ Vamona	Volleybal	Vaethal
Cosmopolitan	Beau Monde	⇨ Tsastar	Cluete
Hobro	Neutral	Klok	⇨ Martinair
⇨ Adidas	Prive	Story	Mijn Geheim

Het aandacht selectie model: de effectiviteit van opvallende merknamen

Samenvatting

Hoofdstuk 1. Binnen het consumentengedragsonderzoek in het bijzonder het reclameverwerkings- en reclame-effectiviteitsonderzoek speelt het concept *aandacht* een zeer belangrijke rol. In praktisch alle voorgestelde communicatie-informatie-verwerkingsmodellen neemt aandacht een prominente plaats in. Aandacht wordt opgevat als een noodzakelijke voorwaarde om reclame-effectiviteit te realiseren. Het is daarom zeer opmerkelijk dat er binnen het consumentengedragsonderzoek bijna geen onderzoek naar het concept aandacht zelf is gedaan!

Het huidige denken over aandacht en de modellering van aandacht is in feite simpelweg overgenomen uit de experimenteel psychologische literatuur dat onderzoek beschrijft over de perceptie (waarneming) van visueel binnengekomen informatie. Belangrijk is dat deze overgenomen aandachtsmodellen, het Filter model (jaren 60), het Capaciteitsmodel (jaren 70) en het Resource model (jaren 80), niet meer of nauwelijks nog worden gehanteerd binnen het perceptie-onderzoek. Daarentegen hanteren consumentengedragsonderzoekers deze drie klassieke aandachtsmodellen nog steeds. De prominente rol die het concept aandacht binnen de reclame-verwerkingsmodellen krijgt vraagt echter om een gefundeerde theoretische en empirische onderbouwing. Een reden temeer is de belangrijke paradigmatische verschuiving in het denken over aandacht die zich in het perceptie-onderzoek (jaren 90) heeft voorgedaan en die niet lijkt te zijn opgemerkt door consumentengedragsonderzoekers.

Hoofdstuk 2. In het tweede hoofdstuk wordt een overzicht gegeven van de paradigmatische verschuiving, die een verandering in het denken over selectieve aandacht binnen het perceptie-onderzoek te weeg heeft gebracht. Een belangrijk uitgangspunt binnen het visueel perceptie-onderzoek was dat de informatieverwerkingscapaciteit van het visuele systeem in de menselijke hersenen te beperkt is zodat niet alle binnengekomen informatie tegelijkertijd kan worden verwerkt. Het concept aandacht werd voorgesteld als een proces dat zorgt voor een selectieve verwerking van de binnengekomen informatie (selectie-voor-perceptie). In het nieuwe paradigma wordt het visuele systeem niet meer opgevat als gelimiteerd in informatie- verwerkingscapaciteit. De gedragingen (acties) echter, die tegelijkertijd kunnen worden uitgevoerd zijn zeer beperkt waardoor andere functies voor selecties noodzakelijk zijn (selectie-voor-actie en selectie-voor-geheugenopslag). De selectie-voor-perceptie functie wordt hiermee dus los gelaten. Bij de klassieke aandachtsmodellen werd perceptie *an sich* opgevat als dé functie van het visuele systeem. Het nieuwe paradigma stelt dat het visuele systeem dient om richting te geven aan acties (gedragingen). Deze functionele relatie tussen perceptie en actie is zeer relevant voor het onderzoek naar reclameverwerking (perceptie) en reclame-effectiviteit (actie). De visie dat het brein ongelimiteerd is in verwerkingscapaciteit staat loodrecht op bijna al het denken binnen het consumentengedragsonderzoek.

Tegelijkertijd sluit ook de fundamentele aard van perceptie-actie-onderzoek niet aan bij het veel meer toegepaste consumentengedragsonderzoek. Consumentengedragsonderzoek wordt in hoge mate gekenmerkt door betekenisvolle stimuli (advertenties) terwijl de stimuli bij het perceptie-actie-aandachtsonderzoek veelal betekenisloos zijn (gekleurde letters, cijfers of geometrische vormen). De aanbiedingstijd van een stimulus bij het perceptie-actie-aandachtsonderzoek ligt rond de 150 milliseconden terwijl een advertentie tijdens een reclame-verwerkingsonderzoek soms wel enkele minuten wordt aangeboden. Deze impasses en anderen, op het eerste gezicht onverenigbare tegenstellingen, geven aanleiding tot de conclusie dat de nieuwe modellen binnen het perceptie-actie-aandachtsonderzoek niet zondermeer naar het onderzoeksdomein van de reclameverwerking kunnen worden overgebracht. Daarom wordt in dit proefschrift het aandacht selectie model (ASM) voorgesteld.

Het ASM berust op de perceptie-actie benadering en sluit tegelijkertijd aan bij het onderzoek naar reclameverwerking en reclame-effectiviteit. Het ASM voorspelt en verklaart waarom reclame-elementen (bijvoorbeeld merknamen) effectief kunnen zijn. Het ASM laat zien waarom (selectie-voor-actie & selectie-voor-geheugenopslag), hoe (winner-takes-all) en wanneer (exploratieve en doelgerichte visuele zoekstrategieën) opvallende merknamen kunnen leiden tot een meer accurate herkenning. Herkenning wordt in dit proefschift als maat voor merknaam-effectiviteit gehanteerd. Er wordt een onderscheid gemaakt tussen merknamen die opvallend zijn vanwege hun visuele karakteristieken en tussen merknamen die opvallend zijn qua betekenis. Deze merknamen zijn respectievelijk als visueel opvallende en cognitief opvallende merknamen aangeduid. We voorspelden dat de opvallende merknamen accurater zouden worden herkend dan de tegelijkertijd aangeboden contextuele merknamen wanneer respondenten een exploratieve visuele zoekstrategie hanteren. Wanneer respondenten een doelgerichte zoekstrategie hanteren voorspelden we dat de opvallende merknamen even accuraat zouden worden herkend als de merknamen waarmee zij werden geflankeerd. De visueel en cognitief opvallende merknamen zijn dus altijd gerelateerd aan de geflankeerde ofwel contextuele merknamen. Merknamen werden visueel opvallendheid door ze op een witte achtergrond te plaatsen in vergelijking met de grijze achtergrond waarop de contextuele merknamen waren geplaatst. Merknamen werden cognitief opvallend door ze te kiezen uit categorie A (bijvoorbeeld auto's) en ze te plaatsen naast de contextuele merknamen uit categorie B (bijvoorbeeld wasmiddelen).

Hoofdstuk 3. In het derde hoofdstuk wordt een methode voorgesteld die de hiervoor genoemde voorspellingen kan toetsen en het ASM kan falsifiëren. De serial-multiple-item-respons (SMIR) taak wordt geïntroduceerd en de onderzoeksprocedure wordt uiteengezet. In de SMIR taak werden 56 keer 4 merknamen tegelijkertijd aangeboden waarvan steeds 1 merknaam, ten opzichte van de overige 3 contextuele merknamen, opviel. De respondenten kregen de taak om zo snel mogelijk een respons te geven (druk op een knop) op het moment dat er 4 merknamen verschenen. De suggestie werd gewekt dat de reactietijd van de respons werd gemeten. Direct na deze 56 stimulus

aanbiedingen kregen de respondenten een herkenningstaak waarin zij aangaven de eerder aangeboden merknamen te hebben gezien of niet. Vervolgens kregen de respondenten nogmaals 56 keer 4 tegelijkertijd aangeboden merknamen te zien met dezelfde reactietijd taak. Wederom werd deze taak gevolgd door een herkenningstaak. Tijdens de eerste taak hanteerde de respondenten een exploratieve zoekstrategie (men lette simpelweg op het verschijnen van de stimuli zonder weet te hebben dat er een herkenningstaak volgde) en tijdens de tweede taak hanteerden de respondenten een doelgerichte zoekstrategie (men wist nu dat er een herkenningstaak volgde waardoor men intentioneel naar de merknamen keek - al wist men niet welke merknamen belangrijker waren). Er worden in dit hoofdstuk 10 gerelateerde experimenten beschreven waarin voor 2 verschillende visuele zoekstrategieën (exploratief en doelgericht) en voor 3 verschillende aanbiedingstijden (0,5, 1 en 2 seconde) de herkenningsaccuraatheid van merknaamopvallendheid (visueel, cognitief, visueel+cognitief) werd gemeten. De manipulatie van visuele zoekstrategie werd uitgevoerd binnen proefpersonen (within-subjects), en de manipulatie van de aanbiedingstijd en merknaamopvallendheid werd tussen proefpersonen (between-subjects) uitgevoerd. In totaal namen 250 respondenten deel aan deze experimenten.

Hoofdstuk 4. Dit hoofstuk beschrijft de resultaten van de 10 experimenten. Conform de verwachtingen werd gevonden dat onder de exploratieve visuele zoekstrategie visueel opvallende en visueel+cognitief opvallende merknamen accurater werden herkend dan de contextuele merknamen. In tegensteling tot de verwachting werden de cognitief opvallende merknamen juist minder accuraat herkend. Onder de doelgerichte zoekstrategie en bij relatief langere aanbiedingstijden van de stimuli werden de opvallende merknamen (visueel, cognitief, visueel+cognitief) even accuraat herkend als de contextuele merknamen. Tenslotte worden deze bevindingen bediscussiëerd in het licht van het ASM. Het ASM verklaart deels de gevonden resultaten. Aannemelijk wordt gemaakt dat met een aanpassing van het ASM alle resultaten kunnen worden verklaard.

Hoofdstuk 5. In het laatste hoofdstuk wordt het huidige denken over aandacht binnen het consumentengedragsonderzoek nog eens geïllustreerd. Vervolgens wordt bij enkele relevante en belangrijke onderzoeksvraagstellingen het ASM als alternatieve verklaring opgevoerd en worden suggesties gedaan voor vervolgonderzoek.

De auteur van dit proefschrift gaat ervan uit dat inzicht en begrip met betrekking tot selectieve aandacht gezocht moeten worden in de structuren, mechanismen en verwerkingsprocessen van het menselijk brein, dat interacteert met de omgeving waarin de consument zich bevindt. De auteur van dit proefschrift beseft dat er op dit moment een enorme kloof bestaat tussen enerzijds de structuren en strategieën van het menselijk brein (theorie) en anderzijds de praktijk van de reclamemakers die zich richten op een effectieve reclameboodschap. Er is een poging gedaan om deze kloof gedeeltelijk te dichten door aan de ene kant het ASM voor te stellen en aan de andere kant rekening te houden met zaken die consumentengedragsonderzoekers belangrijk vinden, in het bijzonder die onderzoekers die zich bezig houden met de werking en effecten van reclame.

Stellingen

Behorende bij het proefschrift **The attention selection model: The effectiveness of conspicuous brandnames** door Johan de Heer.

1. Binnen het consumentengedragsonderzoek, in het bijzonder het reclameverwerkings & reclame-effectiviteitsonderzoek, speelt 'aandacht' een opvallende rol. Aandacht wordt opgevat als een noodzakelijke voorwaarde tot het realiseren van reclame-effectiviteit. Dit betekent overigens niet dat onderzoek met betrekking tot verwerking en effectiviteit van commerciële stimuli aan de noodzakelijke voorwaarde aandacht besteedt (dit proefschrift).

2. Reclameverwerking en reclame-effectiviteit kan alleen worden begrepen vanuit een theoretisch model over aandachtselecties dat gefalsifiëerd kan en dient te worden (dit proefschrift).

3. Het centrale uitgangspunt voor theorievorming binnen het consumentengedragsonderzoek is dat informatieverwerkingscapaciteit van de menselijke hersenen beperkt is. Dat dit belangrijke uitgangspunt een aanname is wordt niet of nauwelijks beseft (dit proefschrift).

4. Opvallende merknamen zijn niet altijd effectief. De effectiviteit hangt af van:

   - het type opvallendheid: visueel en/of cognitief;
   - de door de consument gehanteerde visuele zoekstrategie: exploratief of doelgericht;
   - en de aanbiedingstijd van de merknamen.

   (dit proefschrift)

5. Ook onderzoek naar reclame beschrijft een stukje van de werkelijkheid. Derhalve dient artikel 17 punt 4 van het promotieregelement van de KUB, alwaar wordt gesteld dat het proefschrift vrij dient te zijn van reclame, te worden aangepast.

6. Het economische gedrag van intelligent agents zijn niet meer dan datgene wat, bij zijn of haar baas, een verrassing oproept.

7. De doelstelling van de Psychologie zou moeten zijn 'het wegredeneren van psychologische constructen'. De toename in het aantal opgenomen psychologische constructen in woordenboeken van de Psychologie geeft aan dat de Psychologie ver van haar doelstelling is verwijderd.

8. Stel ingewikkelde zaken zo eenvoudig mogelijk voor, maar niet té eenvoudig.

9. Het gaat erom een moment van de abstractie aan de werkelijkheid te ontfutselen zodat je iets kunt generaliseren (Johan van der Keuken, fotograaf, cineast).

10. Het onontkoombare bewijs voor de aanstaande moeder wordt gegeven door de combinatie van een zelftester, huisarts, verloskundige en een echoscopie. De zwangere vader heeft dit bewijs niet nodig.

Arnhem, Februari 2001